EDISON ELECTRIC INSTITUTE BULLETIN

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EDISON ELECTRIC INSTITUTE

STATISTICAL DATA OF THE ELECTRIC LIGHT AND POWER INDUSTRY

Compiled Monthly by the Edison Electric Institute—Covers 100% of the Industry

DURING THE MONTH OF AUGUST

	1936	1935	%
Killowatt-hours Generated* (net)			
By Fuel	6,412,827,000	4,980,885,000	+28.7
By Water Power	2,752,734,000	2,991,469,000	− 8.0
Total Kilowatt-hours Generated	9,165,561,000	7,972,354,000	+15.0
Additions to Supply			
Energy Purchased from Other Sources	150,298,000	180,731,000	−16.8
Net International Imports	116,001,000	81,728,000	+41.9
Total	266,299,000	262,459,000	+ 1.5
Deductions from Supply			
Energy Used in Electric Railway Departments	41,436,000	40,607,000	+ 2.0
Energy Used in Electric and Other Departments	114,451,000	115,755,000	− 1.1
Total	155,887,000	156,362,000	− 0.3
Total Energy for Distribution	**9,275,973,000**	**8,078,451,000**	**+14.8**
Energy Lost in Transmission, Distribution, Etc.	**1,552,560,000**	**1,464,192,000**	**+ 6.0**
Kilowatt-hours Sold to Ultimate Consumers	**7,723,413,000**	**6,614,259,000**	**+16.8**
Sales to Ultimate Consumers (kwhr)			
Domestic Service	1,179,829,000	1,073,292,000	+ 9.9
Commercial—Small Light and Power (Retail)	1,360,637,000	1,177,209,000	+15.6
Commercial—Large Light and Power (Wholesale)	4,487,257,000	3,734,443,000	+20.2
Municipal Street Lighting	187,965,000	180,207,000	+ 4.3
Railroads—Street and Interurban	340,066,000	332,533,000	+ 2.3
Railroads—Electrified Steam	97,174,000	67,399,000	+44.2
Municipal and Miscellaneous	70,485,000	49,176,000	+43.3
Total Sales to Ultimate Consumers	7,723,413,000	6,614,259,000	+16.8
Total Revenue from Ultimate Consumers	$169,636,200	$156,038,300	+ 8.7

DURING TWELVE MONTHS ENDING AUGUST 31st

Kilowatt-hours Generated* (net)			
By Fuel	64,714,092,000	52,777,912,000	+22.6
By Water Power	36,107,792,000	35,715,287,000	+ 1.1
Total Kilowatt-hours Generated	100,821,884,000	88,493,199,000	+13.9
Purchased Energy (net)	3,036,289,000	2,912,353,000	+ 4.3
Energy Used in Electric Railway and Other Departments	1,941,396,000	1,971,344,000	− 1.5
Total Energy for Distribution	**101,916,777,000**	**89,434,208,000**	**+14.0**
Energy Lost in Transmission, Distribution, Etc.	**16,651,765,000**	**15,416,009,000**	**+ 8.0**
Kilowatt-hours Sold to Ultimate Consumers	**85,265,012,000**	**74,018,199,000**	**+15.2**
Total Revenue from Ultimate Consumers	**$2,011,702,800**	**$1,886,683,100**	**+ 6.6**
Important Factors			
Percent of Energy Generated by Water Power	35.8%	40.4%	
Domestic Service (Residential Use)			
Average Annual Consumption per Customer (kwhr)	705	656	+ 7.5
Average Revenue per kwhr (Cents)	4.82¢	5.15¢	− 6.4
Average Monthly Bill per Domestic Customer	$2.83	$2.82	+ 0.4

BASIC INFORMATION AS OF AUGUST 31st

Generating Capacity (kw)—Steam	24,079,100	23,712,000	
—Water Power	9,011,800	8,951,300	
—Internal Combustion	499,400	499,800	
Total Generating Capacity in Kilowatts**	33,590,300	33,163,100	
Number of Customers			
Farms in Eastern Area (Included with Domestic)	(641,407)	(552,181)	
Farms in Western Area (Included with Commercial—Large)	(236,638)	(215,424)	
Domestic Service	21,409,389	20,888,431	
Commercial—Small Light and Power	3,779,426	3,755,988	
Commercial—Large Light and Power	511,410	508,714	
Other Ultimate Consumers	61,659	67,241	
Total Ultimate Consumers	25,761,884	25,220,374	

* By courtesy of the Federal Power Commission, with deductions for certain plants not considered electric light and power enterprises.
** Old Series both years—subject to revision to agree with data contained in Statistical Bulletin No. 3.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume IV OCTOBER, 1936 No. 10

Synchronizing "Telling and Selling"

By James E. Davidson

President, Nebraska Power Company, and Vice-President, Edison Electric Institute

An address before the INDIANA ELECTRIC ASSOCIATION, French Lick, Ind., Oct. 1, 1936

I HAVE watched with interest the steadily growing transformation of the railroads from aloof carriers of freight and humans, to cooperating service agencies . . . cooperating not only for the benefit of their security holders, but also for the benefit of their shippers and the traveling public.

We all know what the railroads have endured . . . political attacks, which, in years gone by, they have left unanswered . . . unfair competition . . . unfair regulation. There was little employee education, and practically no railroad industry cooperation.

But—the railroads have taken a new lease on life. Their increasing interest in passenger comfort is symbolic. They have taken a page out of the history of the orange growers, the cement manufacturers, and other cooperating industries.

They are cooperating in informing their public about their problems; also, in advertising and selling their much improved freight and travel services. This cooperative enlightenment policy is not only increasing their business tremendously, but is also winning the sincere and sympathetic admiration of the public. Cooperation and unified, well-directed energy are doing the trick!

Our electric industry has done a splendid job of selling its services and keeping the public informed. But it can do an even better job. How?—By cementing more closely our mutual interests, and cooperating more actively with other electrical appliance-selling agencies; by obtaining greater cooperation from our employees; by cooperating more closely with our stockholders; and by carrying on a program of cooperative enlightenment with our customers. All forces possible must combine to sell to all

MR. DAVIDSON

America a greater appreciation of our good service, our progressiveness, and our policy of consistently lowering the cost of electric service.

Unified National Program Desirable

Our industry has not done a poor job—in the main, it has done an excellent one; but, even though we have a splendid record for our half century of service, a better job of public enlightenment, in regard both to the problems of our companies and to the many services we have to offer, can and should be carried out on a more unified, cooperative national scale, with strong local interest and enthusiasm.

The remarkable rejuvenation of the railroads, during these times of political and economic stress, should stimulate us of the electric industry who already know the benefits to be derived from cooperative endeavor.

We, of the electric service companies, know what befell the rail utilities because, for too long a period, they had no unity of interest and energy in solving their problems. Their activity is just 36 years late! It should have been launched in 1901, when the tide of unfair political attack was producing waves of bitterness and hatred. Let their present cooperative energy be an example to us.

Let us not be too late!

If we place our electric companies and their accomplishments on proper public display, I know the people will be fair and just in their thinking. To do this correctly calls for a unified program.

Fighting for Our Share of the Consumer's Dollar

I have been associated with our industry's activities for more than thirty years. If I have done nothing else to bring me gratification during that time, I feel repaid by the success of the two nation-wide cooperative movements of our industry, of whose executive committees I was privileged to be chairman. These were the Home Lighting Activity, of '25 and '26, and the Electric Refrigeration Campaign, launched in '31, to both of which I now point, with pride, as examples of unity in action.

When I was chairman of the Commercial Section of the National Electric Light Association in 1928, I made an address at Atlantic City, in which I urged upon the industry the joining, on a nation-wide scale, of all our forces in a mass cooperative advertising and selling of electric service. I called attention to what had been accomplished by other industries through cooperative commer-

cial action. Florists, cement manufacturers, orange growers, copper producers, and thirty other industries had recognized the value of cooperative selling and advertising. They realized that their real competitors for business were not those of their own industry, but those of other industries who were fighting for their share of the consumer's dollar.

Cooperation—From Flowers to Cement

The florists, with their slogan, "Say it with flowers," have coordinated their selling and advertising activities in order to out-sell other birthday and anniversary gifts. Florists sell not only flowers—they also sell sentiment. The cement manufacturers joined a decade ago to convince the people that concrete was better for pavement than any other material. The orange growers cooperated to make America orange-conscious, and in so doing, they sold, not only oranges, but health as well.

Now—let us cooperate in selling our services—services that bring contentment, pride, convenience, economy, and health into American homes.

Among the commercial leaders of the Edison Electric Institute I have observed with pleasure a unanimity of opinion that, not only should we sell "use" and service, but that this thought should be put across under the banner of national and local cooperation. "Cooperative Enlightenment" should be our motto for 1937.

National Committee Plans Call for Cooperation

Plans of our National Sales Committee call for nation-wide and local cooperative advertising and selling in putting over the all-electric kitchen, better lighting, air-conditioning, electric cookery, electric refrigeration, electric water pumping and water heating. Every one of these cooperative activities will be headed by experienced leaders of our industry, and backed up by effective promotional and advertising material, and sales plans. Every utility company should join in this cooperative endeavor of all-year-round load building. Such cooperation will develop greater selling efficiency among dealers, which will result in more merchandise sales, stronger friendships, and increased service to our consumers. I hope your companies will enthusiastically support all of these cooperative activities, which will bring the success that we all desire.

You don't need proof of what can be accomplished by cooperative advertising and selling. Your exhibits of such successes are the "Home Lighting," the "Electric Refrigeration Bureau," and the "Better Light—Better Sight" cooperative activities. They have demonstrated what can be accomplished when the energies of all are synchronized behind the same plan.

Our Home Lighting educational activity of eleven years ago began the promotion of proper lighting in the home. Some of you will remember that, after reading the 10 million primers and other literature that were distributed to them, the school children of America wrote over a million essays on the subject, "What Constitutes Good Home Lighting." These pupils are young men and young women now, and even though this activity was non-commercial, our industry is benefiting by their early education.

Respect and Confidence—Plus Sales Results

The Electric Refrigeration Bureau resulted in the selling of approximately 4,200,000 refrigerators in four years, adding more than $80,000,000 annually in new revenue to our lines, and bringing immeasurable conveniences, economies, health, etc., to our customers.

The Better Light—Better Sight activity has not only been a humanitarian service in preserving eyesight, but it has also brought increased kilowatt-hour consumption, through better lighting.

The proposed sales activities for 1937 provide greater opportunities than ever before for our utility companies, by cooperating with all electrical dealers, to build a public consciousness of the many home electrical services, and to get a larger share of the 1937 consumer dollar.

Once such a consciousness is created, with the same fervor as created by the orange growers, then, and not until then, will the American public fully appreciate the stability and service of our industry.

I have commented only generally on the selling phases of our industry. Plans, when formulated by the National Sales Committee and its sub-committees, will be furnished to you.

Cooperative endeavor not only can create greater sales, but, if properly planned and executed, it can win from the American people greater respect, confidence and appreciation of our splendid service and its very reasonable cost. Recently, someone called my attention to an article I prepared for the *Electrical World* in January of 1934, in which I pointed out that we of the electric industry may not be afraid of the "big, bad wolf," but our fearlessness alone does not provide a solution of the many and varied problems that confront our companies. I went on to say—"We find our country embarked upon many new theories of government and economics. Where these new roads will lead and what effect they will have upon American business, especially upon our industry, is hard to foretell. Regardless of our personal views, if the electric industry fails to recognize the trend of the times, it may be caught in the whirlpool and carried to depths from which it might not emerge for years.

"It is time to take an inventory of ourselves, to map out a program that will protect our interests, the interests of our public, and the interests of the several million men and women who have placed their savings in our trusteeship."

Those statements were made nearly three long years ago. Since that time we were confronted with the Wheeler-Rayburn Bill and other unreasonable and unworkable legislation, as well as an intensification of unfair attacks by some political leaders.

Wheeler-Rayburn Bill Opposition Pointed the Way

But, when the Wheeler-Rayburn legislation, with its accompanying intensified unfair and unwarranted political attacks, was introduced, most of us were already hardened from fighting back. Generally, we backed up against the wall and gave blow for blow, as you all know. Even though the political cards were stacked against us, the spirit shown by a great portion of our industry during the Wheeler-Rayburn Bill struggle surprised our most seasoned enemies. Yet, the results might have been better if the whole industry had cooperated as one large unit, with one objective.

Even so, this opposition of the electric industry, through the Committee of Public Utility Executives, won praise from our security owners and respect from the general public. Our cooperative efforts were not expended in vain, because they directed the scrutinizing eyes of the nation toward Washington, and awakened American journalists and leaders of thought to the dangers of such unfair and impractical legislation. Following this cooperative enlightenment activity, other groups of business men took courage and presented their views to the public, in opposition to similar types of federal and state legislation, aimed to tear down other legitimate businesses. In that way we have made

another important contribution to our nation.

Ex-Service Men Got Their Bonus

Cooperative enlightenment can be carried on just as effectively in selling an idea as in selling merchandise. The ex-service men of America demonstrated this in their nation-wide fight for a bonus. They got the bonus! The effectiveness of an industry or a large group of people, through coordinated endeavor, can be duplicated locally, by power and light companies, each presenting a true picture of its company, its policies, and its problems.

What sort of presentation are you making to your public?

What kind of cooperative job are you doing with your employees?

What kind of cooperative job are you doing with your stockholders?

Keep Your Customers Correctly Informed

Customers are always interested in the affairs of a company which supplies them with many kinds of necessary services—economically, too. Your employees and your stockholders are especially interested in your company, for in reality, it is their company.

Why should you expect to have the backing of your customers . . . why should you expect to hold their confidence and respect, if you keep them in ignorance of the truth regarding your company and the light and power industry, of which you are a part, while they are being constantly bombarded with so-called informational material, prepared and distributed by hostile forces? When the electric industry is attacked as a whole, each of your companies suffers individually.

The majority of our companies have worked spasmodically to furnish their employees with information, so that those employees can properly represent their companies. To Mr. and Mrs. Public, the employee with whom they deal is the company, and when the employee is not properly informed, Mr. and Mrs. Public may become erroneously impressed. Why should you hide your lamp under a bushel, while untruthful and derogatory statements about the scarecrow "power trust" and the damnable things power companies are supposed to have done go unanswered? Your employees are anxious to be informed. They are loyal; they are interested; they have pride, and they want to be able to discuss intelligently their company's problems with their friends, relatives, neighbors, and business acquaintances. Why not make it possible for them to obtain the facts which they are rightfully seeking?

Educational Program Vital For Industry

It is unfortunate that our electric industry, as a whole, discontinued its employee educational program. Many of us in this room have been in this business for more than a quarter of a century, and we still seek information. How can we expect our employees to know about our companies and the electric industry, after studying a few lessons some years ago? Some employees never had any lessons! The Nebraska Power Company has not stopped educating its employees, and we never will!

Likewise, many power companies have sadly neglected their stockholders. The least our companies can do is to send a carefully prepared informative message with every dividend check. There are pamphlets and leaflets containing interesting and fitting statements that could be sent to your stockholder partners. Their attention should also be directed to pertinent radio addresses, magazine and newspaper articles. The late Senator Mark Hanna of Ohio, was at one time being attacked by nearly every newspaper in his state. It was then that he said: "Give me one thousand informed talking men and women, and I will give you all of the newspapers in Ohio."

With all of the employees and security owners properly informed, just picture what a job this intelligent army of men and women could do. What a force for good they could and would be, if a proper cooperative "Tell and Sell" plan were worked out for them.

Tenacity Will Make Cooperation Effective

When it comes to any activity or endeavor, cooperative or otherwise, tenacity is essential. You must keep everlastingly at it, if you want to maintain good employee, good security holder, or good customer understanding.

In making plans for greater sales or friendship building, may I admonish you not to have a plan executed by amateurs. This is one job that must be done well, or not at all.

I have always felt it was unfortunate that the disbanding of the old National Electric Light Association carried with it the elimination of most of the geographical divisions and many state associations. These subdivisions did very valuable work. They coordinated the interests of the separate companies of our industry, and, working hand in hand with the national organization as they did, they exerted a far-reaching influence which resulted in cooperation among electric associations all over the country. You electric people of this great Hoosier state are to be congratulated for keeping your state association alive and active. You show courage, wisdom, and foresight. I hope for the reorganization of a number of the geographical divisions and state associations, on an active, efficient, and useful basis.

Electric Industry May Be Justly Proud

The electric industry has done nothing for which it must bend its knee in humble apology. True, there have been some who erred; some who wronged, but what industry or what profession has been without its share of wrongdoers? I do not exclude the "political profession," either. With more than a half century of service to our fellow men, our industry can place its record of accomplishment beside that of any other industry, or any subdivision of government, for honesty, performance, and sincere service—and feel justly proud.

But this is no time to meditate. This is a time to act! We have a big job to do. We should continue our sales efforts, building greater load, resulting in new opportunities to serve our customers, and greater protection for the investments of our 10 million security owners; and we must unite to protect our industry against the onslaughts of unfair political attacks and unreasonable governmental interference.

Our Theme Song for Next Year

In carrying on, let's make Cooperative Enlightenment our 1937 theme song.

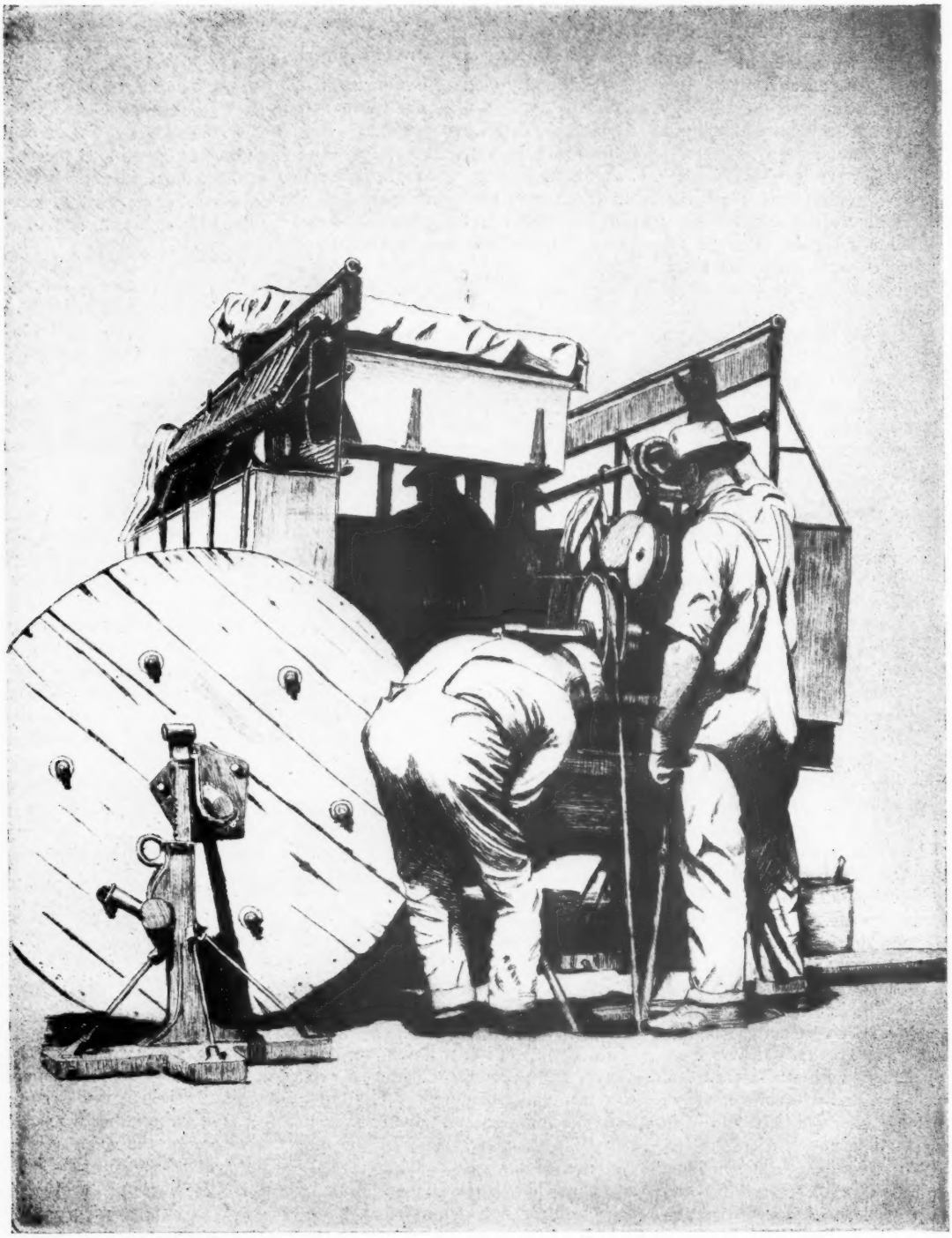
Let's cooperate with every selling agency in the territories we serve, to create sales of every type of electrical appliance and equipment, thereby making for greater use of our service, and consequent benefit to our customers.

Let's enthusiastically participate in every one of the cooperative endeavors that will be presented by the National Sales Committee of our Institute.

Let's cooperate, intelligently and consistently, in educating our employees and our stockholders so that they can crush falsehoods with truth.

Let's carry on today, tomorrow, and every day, a program of cooperative enlightenment, so that the public will have even greater respect for us, and greater confidence in us.

That's our job! Let's do it!



CABLE CREW

Another Etching by Orie Van Rye,
District Engineer, New England Power Association, Providence, R. I.

National Power and Resources Policies in Three European Countries

Abstracts of Three Important European Papers Delivered at the World Power Conference. Foreign Policies Are Stated to Be the Encouragement, Under Reasonable Regulation, of Private Initiative Rather Than Its Destruction.

ENCOURAGEMENT, not destruction, of private initiative was emphasized in the three principal European papers dealing with the subject of National Power Policies at the recent World Power Conference. As summed up by Dr. W. Pohl (Germany) "the principle of reliable service should even overrule the principle of supplying at cheap rates and customers can enjoy permanent satisfactory service only when utilities are in a position to increase their efficiency and reduce production costs." The arbitrary interference of the State, in the form of attacks upon the profits of the utilities, in the form of State-owned competitive enterprises or in the direct interference with the details of management is deplored by M. Ernest Mercier (France), who points out that this "constitutes an offence against contemporary civilization," destroys the confidence of the small investor and ruins the credit by which the electrical industry has been developed to its present state of excellence.

The following constitute abstracts of the papers of the spokesmen of three of the largest power-producing countries of Europe. The views of M. Mercier, containing many important observations on the competitive position of waterpower, are published at greater length than those of Dr. Pohl and Mr. Cösta Malm, of Sweden, who confined their studies largely to the legalistic aspects of the problem.—Ed.

FRANCE

By Ernest Mercier

Président de l'Union d'Électricité et de la Compagnie Française des Petroles, et; Président du Comité National Française de la Conférence Mondiale de l'Énergie

THE main problem for consideration by the World Power Conference in 1936 is that of determining in the broadest and most general manner which is the best method for a country to adopt with a view to arriving at the most efficient exploitation of its power resources.

The question appears quite simple, at all events in so far as the definition is concerned; but on closer examination it is perhaps not quite so simple. In fact it appears indispensable to dwell a little on the meaning of this expression "of efficient exploitation."

There are several points of view to be considered here:

First of all, with regard to the private consumer; for the exploitation of power resources to be a maximum efficiency, it is necessary and sufficient for all the power which he may require to be placed at his disposition in the most convenient form, in the safest and most unfailing conditions, and at the lowest price.

There must be no misunderstanding on this point.

But if instead of catering to the isolated consumer, the whole community to which he belongs, and the country of which he is a citizen is considered, the question becomes more complicated; it may in fact arise that the solution resulting in the lowest sale price to the individual consumer is not at the same time the most satisfactory solution for the community.

This shows clearly that the problem of power, considered in this light, places the question in the field of politics, because its solution implies a certain degree of intervention by the public authorities; it is therefore no longer a question of purely liberal economics, but of a liberal economy tempered by State control, of a directed economy, or of economy completely controlled and directed by the State.

In the study which follows, this strictly political aspect of things will be neglected in order to attempt to determine the directing principles of a power policy, based first of all on the interests of the community, in a country having a democratic constitution such as France.

Economic Disadvantage of Promiscuous Development of Water Power

It is apparent that hydroelectric generating stations introduce a more broken regime into economic life than the thermic stations. But this discontinuity is magnified considerably for various reasons which must be mentioned here.

There is an increasing tendency to give up the utilization and equipment of waterfalls of lesser importance, because from the point of view of general interest this equipment does not yield any appreciable advantages. The main effort is directed to powerful installations, which are the only ones which can really fight against the great modern steam-generating stations, and they often do so with advantage. Moreover, technical progress in the course of the last few years is reacting in the same direction by rendering possible concentrations of power before which one would have hesitated only a short time ago.

But, quite the reverse of steam-generating stations, for which after all it is quite easy to model the development in accordance with the increase of the requirements themselves, a hydroelectric station necessitates in most cases the complete execution initially of a considerable proportion of the total works, especially the work in connection with dams, water intakes, penstocks, etc. Under these conditions, there is rarely any advantage to be gained by not installing at the same time the essential generating plant properly so called.

Hydroelectric installations as soon as completed throw on the market, all at once, enormous quantities of power and energy, which cannot be done without causing very great disturbances in the commercial developments of an industry which requires stability as much as and more than others, because of the extent of its investments.

There also results an intermittent regime in the undertakings which brings about alternating periods of very great

activity but which are irregular, followed by a long period of rest and digestion.

On this subject, the hydroelectric industry has an appreciable tendency to act in such a manner as to aggravate economic crises.

If in the present condition of economics and in the social conditions of today, it would be, as we have already emphasized, very unfavorably considered and dangerous to push on too actively with the utilization of waterfalls. This danger is the same always encountered when attempts are made to change too quickly an established economic regime; but if one has in view a more distant future, characterized by a better adaptation of economy to the technical means available, and as a result accompanied by a progressive and general reduction in duration of working hours, the equipment of waterfalls would appear as a means of production of power better and better adapted to requirements.

None of the observations which precede are sufficient to bring forth a definite conclusion, neither in favor of the steam generated electric power industry, nor against the hydroelectric industry, but all converge toward this basic conclusion to the effect that the selection of the solutions to be adopted should not in any way be derived from a sentimental position taken *a priori*. The public interest demands a complex and very close study of this subject, giving full consideration to an extremely high number of factors to which in the past sufficient attention was not paid.

Suggestions for Tempering World Malady of National Planning

While the world malady of planning appears dangerous because it claims to be able to settle in advance everything with regard to the economic destinies of nations, yet in the domain of electric generating installations, the establishment of a general program which could be revised and adjusted from year to year, stands out as an obvious necessity.

But before pushing on further, an observation must be made which may cause surprise, as we are not accustomed to consider things from this angle but which is nevertheless of capital importance:

The most important source of power for a State is the energy represented by its population: Ordinary labor and specialists. It is all the more important because it conditions and directs the utilization of all other forces, and very much more so, because it is accompanied by an intellectual and moral force.

A national plan for the utilization of power which would neglect this essential factor would be essentially inadequate.

In this connection, unemployment, even with the correction of unemployment assistance, represents the most serious wastage of power which can be experienced by a State.

From this it follows directly that—

(1) Between two methods of power production of equal cost, that which makes the greatest use of the national resources in labor and technical capacities must be selected.

(2) A country well endowed with coal should proceed with extreme caution with the equipment of its hydroelectric resources.

(3) A country endowed with a considerable metallurgical industry and an abundant "working up" industry (boilers, engines, electrical plant) has all the more reason for avoiding unemployment in these industries by a too extensive or too rapid program for hydroelectric equipment.

On this subject it must be observed that the development and improvement of steam power stations by pressing forward toward the adoption of higher and higher temperatures and pressures opens new roads for human activities which are of great importance to general progress.

The conclusion of these observations is that it is necessary in the programs of development of a country not to lose sight of the fact that it is not only a question of cost but also one of human and social problems. This shows how it becomes necessary to make a deep study of all factors coming into play.

How can such a study be turned to advantage?

The problem is capable, obviously, of different solutions in each country, according to the political regime. We will limit ourselves here to what may arise in a democratic country where industry still enjoys fairly extensive liberty.

The solution of the problem in question necessitates a close knowledge and interpretation of a whole series of information of which the following are the principal: Requirements in electric power—their special characteristics—their geographical situation.

A complete comparative tabular statement of the possibilities of hydroelectric equipment, with individual characteristics and at least close information regarding costs of production.

A complete comparative tabular statement of the projects for steam power stations, either new, or by the extension or transformation of old stations, with all possible information regarding cost of production, their technical and economic details.

The general situation of exploitation of coal workings, with their probable evolution in the course of later years.

The general situation of national industry, particularly regarding labor and unemployment, and its probable activity in the course of the next few years and especially regarding metallurgy, allied industries, manufacturies (engineering, electrical, boiler works), cement works, etc.

General situation of the country in so far as its supply of the principal raw materials required for one or the other of the methods of equipment for electrical generation is concerned.

The chances of arriving at the best solution depend on the conditions under which the experts, who are specialists in the different interested sections, can discuss fully and completely the various alternative possibilities under the arbitration of the State.

Superiority of Private Initiative

Food and economic working is generally, and particularly in France, the result of free enterprise very much more than that of State or officially controlled enterprises. In effect, free enterprises, very much more than public collectivities, possess the possibility of placing responsibilities exactly, of applying immediate sanctions, of obtaining a higher output from the personnel. Their management, in addition, is much more inclined by reciprocal emulation to adopt the most recent technical progress; their financial management is less subordinate, and therefore more efficient; the commercial spirit is more spontaneously developed. For these reasons we think in France that in the interests of the community it is preferable that untrammelled initiative should continue to manage the electrical industry which it has known how to create and develop with incontestable success, under the control of the State.

The indisputable economic necessity for interconnections and working in parallel leads to this conclusion, that in a country like France, the production and distribution of electricity constitutes a whole, tightly united, and which, therefore, if it is normal and desirable that the exploitation of it should continue to be assured by independent com-

panies having a supple and handy organization, it is indispensable that these different companies should be, in the aggregate technically associated and obedient to a common discipline; although France is a very individualistic country it has not met with any difficulties in this direction up to the present.

Efficient Regulation Compared with Arbitrary Acts of Government

The electrical industry escapes to a certain extent the laws of supply and demand, because it is withdrawn from the action of free competition; a true competition would, in effect, involve, besides the material difficulties, such a surplus equipment that it would be rapidly ruinous for the public who would have to bear all the expense, either as a consumer or as shareholder.

It is therefore necessary to organize a mechanism which will allow the interests of the public to be safeguarded in the same manner as free competition would do if it were allowed to act effectively.

This mechanism would necessitate State intervention, or, if it is preferred, that of the conceding (licensing) authority.

This intervention can take place in several ways, some natural, correct, efficient, and beneficial; others abnormal, arbitrary, and harmful.

Natural intervention is that which proceeds from acts of concession (licenses).

It is correct, because it is the direct consequence of the concession contract which constitutes the law of the parties; it is in virtue of this law, and under its protection, that the concessionary companies have appealed for public credit or to the resources of their shareholders, for investment in their concession.

It is efficient, because the conceding authority, by the same contract, has at its disposal all legitimate means of action allowing it to adapt tariffs to the variations of economic conditions. It has even happened very frequently in France that the conceding authority has been able to obtain much better satisfaction than that provided for by the letter of the contract. The conceding authority, moreover, relies on public opinion, that is to say on the mass of its clients, and thereby is in possession of a particularly powerful lever.

The results which have been attained in France by this method are, speaking generally, as satisfactory for the clientele as for those of the principal European countries whose methods are frequently rather considerably different.

Abnormal intervention is that which is applied against the contractual obligations of the act of concession.

It is arbitrary precisely because it arises from unilateral initiative.

It is harmful, in the first case, because every attack against respect of the contract constitutes an offense against contemporary civilization itself, and a return toward the methods which man has painfully succeeded in repressing after centuries of assiduous effort and sometimes at the price of revolutions. It is particularly harmful, with regard to the electrical industry, in that it destroys the confidence of the small investor in the stability of the undertakings, and that thereby, it ruins the credit thanks to which these undertakings have been enabled to develop the industry with extreme activity, sustained energy, accepting all risks to bring it to the point of very remarkable progress where it is today.

Among arbitrary and harmful forms of interventions in France we classify:

(a) Interventions which are intended to strike against the companies because of the profit which they realize, without taking into account the financial efforts really borne by the shareholders, neither the privations of dividends which they have supported previously for many years in order to establish the prosperity of their undertakings, nor the technical risks they have run at a time when the collectivities were not in any way prepared to take, nor capable of surmounting. Such interventions can only tend to discourage well-managed undertakings, by standardizing methods of management on the most reprehensible models.

(b) Also direct intervention of the State in the industry itself, to create or support undertakings destined to compete with free enterprise, without respecting the essential principle of equality of responsibilities and rights, and the arbitrable impartiality of the State.

(c) *A fortiori,* and State intervention in the management of the free undertakings already existing, of which all the previous development has been the exclusive result of private initiative, and fed only by private capital.

We are of the opinion that these methods could not lead to a satisfactory solution of the economic problem, not only because of the disturbance which they cause in business and in the minds of those concerned, but also because it appears chimerical to lighten the consumers' expenses in power by charging general expenses to the budget, which finally fall again on the consumers in the form of taxes.

The preceding observations are opposed to the more or less spectacular solutions advanced under the influence of political sentiments instead of economical reasons.

Should we worry?

This would certainly be necessary if from the point of view of the consumer, the considered practice of such methods had led to an unfavorable solution, and if it were consequently desirable to remedy, even brutally, such evident abuses.

This is the point which must be examined with care.

Prevailing Methods of Management Should be Maintained

In Paris, the price per candle-hour of illumination has therefore fallen in 30 years to a sixtieth of what it was originally, in the same time that methods of use were accomplishing enormous advances.

It can be said that never in human history has there been an economic revolution of such an extent. This revolution is the work of free industry, of free enterprise wisely controlled by the State.

In the face of such a brilliant success, one may well be astonished by the attacks suffered by an industry which has so well fulfilled its social role. Moreover, in the present condition of things the expenditure on electric power of a small average French household, for its lighting and domestic needs, does not reach 1 per cent of its total budget expenses.

This figure proves that the client does not suffer at the present time from any generalized abuse. There may perhaps be, notably in the country, unfavorable individual cases which might be improved; these individual cases represent an insignificant minority, very much less than 10 per cent of the total consumption and their reestablishment would not in any way justify a general disturbance.

For consumers of motive power the situation is quite different. But for this class of consumers, electric power is subject to extremely efficient competition from the other means of power production, the reverse of the position for lighting, where these other means have disappeared forever.

The preceding observations appear to us to show that the method of manage-

ment, which has prevailed up till now, should be maintained in the interests of the public, with, obviously, the improvements which experience may bring, provided that these improvements are prudent and well considered.

But there is still a side of the problem which is strictly political and not economic—that which concerns certain concentrations designated pyramidal or octopus concerns, to certain developments of powers which are deemed to be excessive or of such a nature as to place too great liberty of action in few hands, and to certain excesses in the remuneration of the directing personnel.

If there have been, or if there still are, abuses of this kind—and this is not the case in France—it is certainly possible to consider them as they are, that is to say, as special cases which must be dealt with in conformity with the legislation proper to the different countries. It does not appear to us that it would necessitate any upheaval of an industry whose progress has been dazzling, which has proved itself to be with such devotion, the servant of social progress in all its manifestations, and whose success has certainly been developed by the technical worth and the professional devotion of all, workers and specialists, who have collaborated to this end.

SWEDEN

By Cösta Malm

Director-General, Royal Board of Waterfalls; Chairman, Swedish National Committee, W. P. C., Stockholm.

THE present system of power supply in Sweden has developed on the basis of natural conditions prevailing in this country, i.e., ample resources of water power and existing legislation relating to water rights and licenses for power lines. As a consequence of this natural development, the State, which owns powerful waterfalls, has developed its water-power sites, the municipalities, which have sole rights on streets and places, have taken care of power distribution in towns, and private undertakings have shared to a very large extent in power production, owing to the legal facilities of developing water-power sites and of installing transmission lines. These conditions existed already at an early stage, and development has rapidly progressed in all these three groups of undertakings.

Voluntary cooperation and parallel operation of large power companies are widely developed in this country. The allocation of supply areas has also, as a rule, been carried out in a voluntary manner.

The State has not made any attempt to regulate the power supply in this country as a whole by legislative measures, but it shares in the power supply as an independent distributor in free competition with other power suppliers. At the present time, the State power plants rank foremost among power distributors in Sweden and, owing to the fact that the State's main lines cover the greater part of the country, the State rate policy has become a standard for power prices where bulk supplies are concerned.

Retail distribution is for the most part handled by municipal undertakings, utilities, or distribution associations, the share of the State in retail distribution being quite small. The significant trends in retail distribution during the recent years are modernization and rationalization of rates and, in connection herewith, active publicity in favor of rational use of electric energy.

The power policy so far followed in this country and characterized in the first place by free competition, is rooted in the principle of free enterprise which has so far been the foundation of Swedish economic life. At the present time there appears to be no special need for restrictory control in this field.

The watchwords for the next years are expansion of cooperation and rationalization of rates. Both these trends are to be considered as a continuation of the general tendencies of development during the past two decades.

GERMANY

By Min-Dir. Dr. W. Pohl

IN all civilized countries the care of man's working power has always been recognized as part of the State's responsibilities. The technical and economic development of our age has provided man with mechanical energy as a most valuable ally. It, therefore, stands to reason that the way in which the supply of energy and all questions pertaining thereto are organized is of paramount importance as a factor determining the efficiency of national economy. The German government has devoted particular attention to these problems. Within the field of energy supply, electricity and gas deserve special mention. The *Gesetz zur Forderung der Energiewirtschaft* (Energy Economy Act) which was passed by the Government of the Reich on December 13, 1935, placed the relations between the State and these two branches of national economy on a new and important basis.

In view of the technical development, it has proved the best policy, so far, for the utility industry is to leave it alone, unhampered by legal regulation. It is true that, even at the present juncture, the technical possibilities for changes and improvements are by no means exhausted, and in legal regulation, this fact had to be borne in mind. Regulation can promote technical proficiency if it leaves the utilities free to act under their own responsibility and uses authority only to control them from the viewpoint of national economy in order to prevent a state of paralysis which might be conceivable as a result of the monopolistic position held by the utilities.

The utilities are responsible to the people and the State. In other terms they are expected to be carriers of national economy. This obligation includes the safeguarding of their own private interests, but their interests must always be subordinated to those of the community.

The task of the utilities, therefore, is to insure a reliable system of energy service throughout the territory of the Reich and to individual customers at reasonable rates. These viewpoints have determined all stipulations of the Act.

The Energy Economy Act, therefore, fundamentally maintains the independence and liberty of action of the utilities. There is no interfering with conditions of ownership to advance the economic policy of the State, nor are the actions of utilities subjected to approval on the part of the State, except in very few instances. Likewise, no special administrative body has been set up to deal with questions of energy supply, as it was feared that the existence of any such body might handicap commercial activity.

Among the material features of the Act, the construction and the rate policies established deserve special attention. As has been clearly expressed in the preamble and in the "motives" of the Act, as well as in some statements made by the Reich Minister of Economy shortly

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Opportunity for Sales in the Commercial Field

By P. M. Alden

Chairman, Commercial Sales Committee, Edison Electric Institute

ALL CLASSES of customers using our service deserve our constant attention, but there is one class in particular which merits our special concern at this time. It is that class of customer lying between the residence and industrial groups up to a nominal maximum of 25 hp connected load. It is not necessary to make any attempt to convince commercial men of the desirability of this load.

Perhaps it is sufficient to say that Commercial Revenue accounts for a substantial portion of Total Revenue in most utilities, and that commercial sales are made at rates not markedly lower than domestic sales. In addition, the commercial field, consisting as it does of a large number of customers with a wide diversity of use, is relatively stable and is not subject to large fluctuations in use resulting from changes in the business cycle.

There is keen competition in this field because other groups have emphasized the importance of promotional work among the smaller commercial customers. In some of the divisional associations, the Pennsylvania Association for example, commercial sales committees have been organized for several years. There is further recognition of an awakening interest in load building activities with this class of customer as indicated in the formation of the Commercial Sales Committee of Edison Electric Institute. It therefore seems opportune for a review of some of the factors which should be considered in the development of any commercial sales organization, because such information may be helpful to companies which are not now actively promoting this business.

All utility sales programs are directed to one simple goal, the addition of profitable load to the company's lines. And in commercial selling, as in the industrial field, *we must build our sales through service.*

The Commercial Salesman must be able to convince the customer that his statements are reliable and that he is genuinely interested in the customer's problems. Unless he can gain the customer's confidence, he cannot really be successful in holding present load or selling new applications. His first job, therefore, is selling himself and the company he represents. This indicates the importance of careful selection and training of personnel.

To any company contemplating the development of a commercial sales organization, I would suggest the following procedure:

(a) A study of present contacts with the commercial customer group.

(b) A determination of the size of the commercial sales organization which can best cover the market, and produce the most satisfactory results per dollar of expense.

(c) A consideration of whether the commercial sales group should be set up to take care of commercial lighting activities as well as commercial power sales, or whether separate departments should take care of these separate activities.

I would like to briefly amplify these three points because I believe they are fundamental in the development of an effective commercial sales organization.

Present Contacts with Commercial Customers

A study of present contacts with the commercial group may indicate that these customers know the company only through negotiations carried on at the time service was introduced, or through the monthly bill for service, or in some cases through the bill collector. However, the group which is responsible for the arrangement of service facilities and negotiations with new customers, or with present customers moving from one location to another, may well represent the nucleus of a commercial sales organization because:

First—This group is familiar with the type of customer in the commercial field and has been regularly contacting this group, and—

Secondly—These men have a real opportunity, *if properly trained,* to sell the advantages of electric equipment at a time when the customer is usually in a receptive frame of mind, due to the fact that he is just starting a new business, or is expanding.

As a general rule, therefore, it seems to me that the group responsible for negotiations with customers in connection with the extension of service, and the introduction of service facilities, can be made the nucleus of a commercial sales organization. Such a group might well be known as a "Contract Group." In addition to this basic contract group, there should also be a "Promotional Group," whose responsibility it is to develop the load of *existing customers* through personal contact and a survey of the customers' needs.

Size of Commercial Sales Organization

The size of this promotional group will, of course, vary with the number of commercial customers served. In general, any utility having more than 1500 commercial customers should be in a position to profitably use the services of at least one man whose entire time is spent in the development of commercial load. This is in addition to any organization which may already be set up to take care of the introduction of service facilities. Obviously, in a company as small as this, it would be inadvisable to try to divide the duties of the Commercial Lighting Salesmen and the Commercial Power Salesmen. As a matter of fact, in companies having less than 10,000 commercial meters, it is my belief that these functions should be combined, either through a single Supervisor, or through men trained in all phases of commercial business. Generally speaking, however, the problems involved in the development of commercial lighting load are quite different from those involved in the sale of air conditioning, ventilation, and electric counter cooking. Therefore, if several commercial salesmen can be supported by the utility, I believe some of these should concentrate on power developments and others on lighting, both reporting to a single Supervisor, when a total of less than eight salesmen is employed.

With larger companies, the number of men who can profitably be employed in promotional development work can be determined only by experience. My suggestion would be that a start be made with a relatively small group working in the most profitable portion of the market, and that after determining the ratio of revenue to expense which is satisfactory to the Management, this group be gradually expanded until such a

ratio is obtained. Obviously a small group which can concentrate its efforts in the most profitable field will show the lowest ratio of expense per dollar of revenue, but such a group is not necessarily the proper group for that particular company to employ.

Employee Selection and Training

Having determined what present employees are involved in Commercial contract work, and the number of additional employees who should be taken on and trained as promotional men, the next problem is that of employee selection and training. In our experience, the most important factor to be considered in selecting an employee for this type of work is the ability to meet people easily, and to "sell" himself to the customer as a representative of the company. If he can do this, and is willing to make the effort to become thoroughly familiar with the many applications of electricity in the commercial field, as well as with the company's rates and policies, he cannot fail to be successful, if he will keep in mind one simple rule. This may be briefly stated as follows: *The fundamental theme behind all commercial selling must be the profit which will accrue to the customer through the use of the equipment we are trying to promote.* This "profit" may take the form of an increased revenue or a decreased expense, but in any event there must be a tangible monetary gain behind any sales appeal which hopes to be successful in the commercial field. We must never forget that our customers are in business to make money.

Employee Training

Employee training should be directed principally toward instruction in specific commercial applications and in the company's rates and policies. Classroom study should be supplemented by work in the field, at first with a Supervisor and later "on his own." You will find most manufacturers ready and willing to help in sales schools, demonstrations, and educational meetings and should take advantage of this assistance.

Market Surveys

Having employed and trained our promotional sales group, the next step should be a careful market study through personal contact, to determine what commercial uses in the company's territory can best be promoted, and where this promotional effort should be directed. Various methods are available for the compilation of survey statistics and in some cases outside organizations have been employed to make a complete survey covering all uses of electricity on customers' premises. While the employment of an outside group has the advantage that this information is secured rapidly, it is my personal belief that it is usually preferable to permit the commercial salesman to start this survey during his training period. Such survey may take as long as six months, but at the end of this six-month period, the salesman will be well grounded in the principal types of commercial applications and will, if he has properly conducted his survey, have established a friendly personal relationship with a relatively large number of customers in the field to which he is assigned. Thereafter his working schedule can be divided between sales "call-backs" and the survey of additional customers.

In addition to indicating those types of commercial applications which can best be promoted, the survey will show that field which will probably be most productive. Again, depending upon the size of the organization, determination can then be made as to what percentage of the total commercial customer group should be intensively cultivated in the sales program.

Specialists

As the organization of the Promotional Group becomes perfected, certain salesmen will indicate special aptitudes for certain types of applications. For example, some men may show that they are particularly interested in electric counter cooking equipment, while others may prefer the sale of air conditioning and ventilation. Quite naturally, therefore, sooner or later certain promotional men will become specialists in particular fields, so that they may extend the benefit of their knowledge not only to the men in the Promotional Group but also to those men who are concerned with contract work. A large share of the responsibility for the proper training of the contract men, so that they may be on the look-out for new and additional commercial uses, will then devolve upon the members of the Promotional Group, and in the final analysis the contract men, who must of necessity spend a large portion of their time on work which might properly be classed as service rather than sales, will become a source of valuable prospects to be followed up by the men in the Promotional Section.

Merchandising vs. Promotional Selling

Time does not permit a discussion of the relative advantages of merchandising commercial appliances, as contrasted with purely promotional selling. In general, it appears that the majority of those companies which are actively working in the commercial field have felt that this can best be a strictly promotional selling activity, although in some instances when suitable dealer cooperation cannot be secured, it has been necessary for the utility to go out and actually merchandise this equipment. Obviously, if a promotional selling policy is adopted, the cultivation of wide-awake dealer outlets is fundamental to the success of the plan. We have found that the best results are usually secured through original contact with the manufacturer, who in turn designates the local outlets to be cooperated with. It is particularly important to tie in closely with the manufacturers, as many of these manufacturers are not directly interested in our product, and if other sources of fuel or power appear to be more acceptable to the customer than electricity, they will not hesitate to change their equipment accordingly.

Advertising as a Sales Tool

The use of properly directed man power is fundamental to any successful sales activity. However, as a valuable tool to assist the salesman, and make his work more effective, direct mail advertising has been proven to have a very definite place. Frequently it has been possible to arrange cooperative, direct mail advertising programs in which the manufacturers combined with the utility in underwriting the cost. Such direct mail pieces are sent out on a definite schedule and personally followed up by the commercial salesmen. Prospects developed from this personal contact are turned over to the dealers designated by the cooperating manufacturers.

The Commercial Sales Committee of Edison Electric Institute will direct attention this year to the study of sales possibilities to determine where sales efforts can be most effective; best types of organization needed; will study competition in this field; will develop helpful sales suggestions in conjunction with manufacturers on electric cooking equipment especially for the counter and pantry; ventilation; electric heating applications, commercial refrigeration and specialty applications. In addition to whatever constructive assistance that may be rendered there will be that basic endeavor to bring to the attention of all companies a realization of the load-building opportunities in this small commercial field.

Minute Men for the Industry

By H. C. Thuerk
The Utility Management Corporation

A talk before the Convention of the Empire State Gas and Electric Association, Saranac Inn, N. Y., Oct. 1, 1936

LAST June Dr. Adam S. Bennion of the Utah Power and Light Company gave a talk at the convention of the Edison Electric Institute on the subject, *"How Can They Know?"* He explained that the title grew out of a discussion among a group of utility men who were trying to find the answers to another question: "Why do so many people feel as they do toward utilities?"

That is a fair question to raise here at this meeting. Why is it that one of the finest industries in America is the object of so much unfavorable attention? This industry has brought light and cheerfulness to the home; it has advanced the art of entertainment to the point where it has become a part in the daily life of nearly every family in America; this industry has probably done more than any other to relieve men and women from unpleasant tasks; it has in no small way contributed to the high level of production of the American workman and thus made him the highest paid wage-earner in the world; in fact, no other industry in all history has done more to enrich the lives of the great masses. And yet this industry is today the "big bad wolf" of American business. It finds itself faced with the necessity of devoting major attention to the problem of building and holding the good will of its customers and in trying to keep the politicians from "selling it short" to the American people. *What can we do about it?*

There is not a utility man present here today who has not faced that question—and faced it seriously. You know and I know that there is no one simple single answer. The Wall Street angle, the rate question, the holding company, the ambitious politician, the bewildered customer and the untrained employee, all have a bearing on this question.

Now the answer to friendly relations between our customers and our companies today lies not in just rendering good service at reasonable rates. So much information designed to discredit our industry has been literally fed to our

MR. THUERK

customers that the mere performance of our services is not sufficient, regardless of the high quality of that performance. We need more than a high standard of performance these days to bring about a realization in the minds of our customers that the utility industry can and does furnish more reliable and more complete gas and electric service at lower overall costs to the customer than is possible through agencies of municipal, state or Federal governments.

Our policies, our operations and our methods that directly concern the customer are not as well understood by him as they should be. His mind needs to be purged of its misconceptions and given a good counter-irritant for every dose of political propaganda which it gets. Our customers desire prompt, courteous attention in our places of business just as you and I expect prompt, courteous treatment from those to whom we give our business. When they want a municipal plant, they want that change for the same basic reasons that you and I have for making changes. They think they see some advantages in making such a change. People who vote to have a municipal plant have been led to believe that they will gain certain advantages by making this change. If we fail to impress the public with the advantages and the merits of our service, we are going to see more and more of these municipal plant programs crop up.

Furthermore, there is one feature of our business, made necessary by the economics of the utility business, which makes the minds of our customers particularly receptive to criticism of our industry. This feature is the fact that the customer, if he or she wants electric or gas service, may purchase it only from one source—from one company. This fact of itself undoubtedly influences the customer's mental reaction toward us and furnishes the agitator with a weapon with which to attack us. And, let us keep in mind, that loyal and efficient as our employees may be, they are but human and the knowledge by them of this fact unconsciously influences their treatment of our customers.

In our own efforts to cope with this problem effectively we realized that it was fundamental that it be approached from the customer's point of view. We needed first of all to understand more fully the people we serve, keeping in mind that they are really no different from the employees in our own industry—impelled by the same basic urges. And after having done this, then it seemed apparent that we needed to establish more and better outlets for reliable information to counteract the flood of misinformation to which our customers were being exposed almost continually. And so I hope to describe to you briefly today just one step we have taken toward the solution of this problem.

Two years ago this spring the thought was developed in our organization that it would be very helpful to have available in each of our operating companies a group of employees who would be sufficiently well trained that they could be called upon to perform certain tasks which were not part of their regular work. These tasks included such activities as making appliance surveys among our customers, explaining rate

changes to customers through systematic house to house calls and in similar endeavors assist the sales department in its efforts to increase the sale of gas and electricity. It was felt that such a group might well consist of from ten to fifteen per cent of the higher grade employees and it was planned to compensate these employees for the extra work they would be called upon to do. Finally, it was felt that such a group of employees adequately trained could, in addition, serve as outlets for the kind of information which our customers should, and in most cases, want to have about our industry.

And so the Managers' Minute Men came into existence as a part of the Employee's Business Building Plan which had been inaugurated in our System in August, 1932, and under which employees are compensated for prospects resulting in the sale of gas and electric appliances. To quote from our Employees' Business Building Plan Book for the year 1934-35—

"A special feature of the third year's operation will be the inauguration of the Managers' Minute Men. Membership in the Managers' Minute Men will be available to all employees. The requirements for membership are two:

1. The employee will agree to attend, on his own time, meetings of the Managers' Minute Men at least once every two weeks and more frequently when preparing for special activities.

2. Membership in the Managers' Minute Men is contingent on the employee satisfactorily completing the prescribed course in Employee Customer Relations."

It is further stated in this same Plan Book that

"Members of the Managers' Minute Men will have an opportunity from time to time not only to render special and meritorious service to the Company, but to augment substantially their earnings through opportunities to participate in special activities."

It was recognized that the Minute Men in performing these special tasks would come face to face with nearly every kind of problem facing the industry. They would run into questions about bills and service, appliance servicing needs and requests for information of all kinds, and it was important that they be equipped properly to answer these questions.

When a customer faces any one of our employees with a problem, to that customer *that employee is the company*. Upon the answer to that problem usually depends the kind of an impression that is established with the customer. If that employee arouses resentment and antagonism for any reason whatever, that resentment and antagonism is felt toward the company which that employee represents. So we were firmly convinced that the first part of the program of developing Minute Men for these special tasks was the inauguration of a carefully selected and carefully prepared training program.

In providing this training program we enlisted the services of Daniel Starch & Staff, our marketing and advertising counsellors. We divided our job roughly into two parts. This was based on the old sales advice of: *Know your product* and *know your prospect*. Under the heading of "Knowing your product" we decided to develop a training course that would give every employee more information about the utility industry, its policies, and its problems, so that when these subjects came up for discussion they could discuss them intelligently.

Before we could determine the contents of such a course we had to find out just what sort of help the employee himself felt that he needed. This was done by sending to all employees in the System a questionnaire asking them to tell us frankly what questions were most frequently asked by customers and what kind of information and help they most needed to enable them to handle customers' complaints and answer their questions more effectively. Many employees frankly admitted to us that they did not have a satisfactory explanation for many of the most common questions raised by the customer. We found that too often the employee was inclined to fall back on something like "Well, that's a company rule—we'll just have to handle it this way," or "Sorry, madam, but that's what your meter reads so you must have used it some way," or "It must be okay because the Public Service Commission says we can do it."

Finding out what kind of help the employees needed, however, was not enough. It was also important before attempting to start a training program to get the other side of the picture—to find out what the customer thought of the employee. Fortunately, we already had available a survey which had been made among a large number of representative customers, and which furnished us with just the information we desired.

The survey showed that while some customers thought well of our employees others were of the opinion that there was room for improvement. For instance, here are some of the things these customers said:

"The employees don't show any desire to serve you or they don't take an interest in you."
"They give you incorrect information."
"They flatly contradict you."
"They won't give you a direct answer."
"Nobody can answer your questions."
"They look and act bored when you are talking or fail to listen."
"One employee tells you one thing and another tells you something else."

If you take a moment to analyze these indictments they seem to fall into just two general classes: those indicating lack of information and those indicating lack of diplomacy. As a result of our surveys we decided that for the first course we would devote our efforts to supplying adequate information to our Minute Men and discuss with them the reasons back of our policies.

Accordingly, during the fall and winter of 1934-1935 there was made available to our operating companies a preliminary course of 15 conferences which was called "The Managers' Minute Men Training Course" and through text and case problems covered such subjects as the relation of the employee to the customer; our company policies; understanding the public—its wants and what it expects of us; high-bill complaints; appliance servicing problems; inter-departmental cooperation; what goes into the cost of utility service; a brief history of the development of the utility industry; regulation of public utility companies, and, because of its especial timeliness, a discussion of the holding company, and finally, private vs. public ownership.

These conference subjects were discussed at about two-week intervals although the schedule varied somewhat between operating groups. Department heads usually acted as conference leaders.

On company policies alone three conferences were held. The employees first of all were informed as to just what the policies were, then the reasons for them were discussed and finally how best to explain them. They were taught that in order to obtain the customer's confidence they first had to impress him with the fact that they knew what they were talking about; and secondly, that they should try to explain the problem, policy or situation so that the customer realized his interest had been really considered in formulating the policies. They discussed the futility of giving excuses or passing the buck to someone else. They were encouraged to be prepared to offer logical, intelligent reasons that could be

readily accepted by any fair-minded person.

In order that the lessons might be as practical as possible, the employees were given the opportunity to discuss or work out for themselves case problems which were based on actual records or experiences encountered. For instance, we might pull out from the file a letter from one of our customers challenging the accuracy of a bill rendered, together with the reply, and then discuss how improvements might have been made in handling the problem, the point being to make employees conscious of the fact that customers generally are not familiar with technical terms and abbreviations which are a b c to us. Talk the customer's language—if you want to make him understand—was the theme of several such conferences.

Throughout the course was stressed the importance of interdepartmental cooperation, a need which was readily brought home to the employee by calling attention to the many departments and individuals concerned in carrying out even the simplest operation to give the customer the service requested.

Although this initial training course had been designed for use by only 10 to 15 per cent of our employees of each operating company who would form the Managers' Minute Men, several of our General Managers felt that the course should be made available to a much larger percentage and in some cases close to 100 per cent of the employees enrolled.

So much for the information phase of our program. The next year we followed with a program designed to train our employees to supply sound selling technique in their conversations with our customers. In other words, we wanted them not only to say the right thing, but to say it in the right manner.

This Advanced Training Course was called "Principles of Persuasion" and dealt with the simple fundamentals of selling—stressing to the employee the importance of being able to sell himself and being capable of selling his ideas. We built this up around a very simple but effective formula. Employees were impressed with the fact that it was, after all, very simple to develop ability in selling their ideas to others. All that was needed was to handle every human contact in such a way that he will be most apt to get these four responses from the other fellow:

1. I like you
2. I understand you
3. I believe you
4. O.K.—I'm sold

When your employees make it a point to be well liked by the people they contact, your company will be well liked. To make sure the other fellow understands, the employee must first understand, and then he realizes the necessity of patiently staying with his explanation until he sees the light of understanding in the other fellow's face. He knows that in order to gain belief he must have indisputable facts and present them with sincerity and self conviction. And, of course, if he can handle an interview so that the customer likes him, understands him and believes him, I'd say he was close to a sale.

In this program to aid the employees in developing worth-while conference discussions, we not only gave them text material and cited case problems suitable for discussion, but also presented a 15-minute sound-slide film production at each conference. This was done in order to dramatize the important points in each conference in a way that helped to make them interesting and more easily remembered.

The proof of the pudding, it is said, lies in the eating of it. Through the Minute Men organization several operating companies made appliance utilization surveys among their customers. In other companies Minute Men participated in special lighting activities including the distribution of 100-watt lamps free to each residential customer, and the selling of student lamps. In one group a special lighting course was given to 16 selected Minute Men in preparation for this work. In two properties the Minute Men made complete canvasses of all residential and commercial customers to explain personally new rates recently established in these groups. These activities and others like them have been satisfactorily performed by our own employees at a cost and in a manner which could not be duplicated in our estimation through the employment of additional personnel hired temporarily for these specific jobs.

Employees and General Managers alike have expressed satisfaction with the results obtained from this Minute Men activity. Many individual employees give the training credit for changing their entire viewpoint in their contacts with our customers.

In the last annual contest conducted by the Public Utility Advertising Association the Premier Award for material designed to promote employee selling was awarded to the Metropolitan Edison Company, one of our Pennsylvania subsidiaries. An important part of the presentation of the Metropolitan Edison Company in the competition for this award was the training program which I have just described.

Times have changed — enterprises which remain in business are those which are able to adapt themselves to constantly changing conditions. Our utility industry has been built up and carried through the stage of integration of isolated properties by a legion of loyal employees whose principal function was to construct and operate large inter-connected systems. Within a relatively short time our industry passed from that stage to that of severe competition with those forces which work toward the suppression or even the destruction of a successful industry. To carry on, to survive in the face of these forces, requires employees not alone trained in physical utility operation—not alone trained in how to handle materials, but who also are expert in the art of handling people.

Army Rations as Food Cost Index

THE money value of the U. S. Army ration, which varies from month to month, is an index of the cost of food. It is not a precise index because its components will not exactly coincide with the diet of the average family. The following table shows the money value of the ration at various times since the American Revolution:

1775	11.11¢	1918	48.2¢
1812	20.0¢	1927	50.0¢
1838	15.0¢	1933	29.12¢
1860	15.5¢	1934	35.62¢
1898	13.0¢	1935	45.9¢
1917	34.15¢	(Sept.) 1936	43.47¢

Observe the sharp drop in the ration cost from 1927 to 1933 and the correspondingly sharp rise in the ration cost from 1933 to 1935.

The ration of 1775 contained 16 ounces of flour, 16 ounces of beef, 1 pint of fresh milk, 6.857 ounces of dried peas, 1.143 ounces of rice, and 1 quart of spruce beer. In the 1812 ration 1 gill of rum took the place of the quart of spruce beer. In the 1838 ration sugar and coffee had a place and, in the 1898 ration, potatoes. Beef, which for many years was the principal item, was cut from 20 ounces in the 1917 ration to 10 ounces in the 1933 ration and there were added 4 ounces of pork, 2 ounces of bacon, 1 egg, cheese and other substitutes.

E.E.I. Rural Electrification Survey*—Final and Revised Recapitulation of 1935 Data and 1936 Estimates

Data on New Lines Only

	Miles of Line	Cost of Line	Cost of Meters, Services & Transformers	Total Cost to Utilities	Farm Customers	Non-Farm Customers	Total Customers	Cost per Mile of Line	Cost per Mile of Meters, Services & Transformers	Total Cost per Mile	Farm Customers per Mile	Non-Farm Customers per Mile	Total Customers per Mile	Company Investment per Customer
						- 1935 -								
New England	178.81	206,929	39,262	246,191	400	768	1,168	1,157	220	1,377	2.2	4.3	6.5	211
Middle Atlantic	2,090.25	2,076,844	633,704	2,710,548	6,196	4,507	10,703	994	303	1,297	3.0	2.2	5.2	253
East North Central	2,789.91	2,563,477	1,088,283	3,651,760	11,258	2,245	13,503	919	390	1,309	4.0	2.8	4.8	270
West North Central	604.37	507,646	292,234	799,880	2,426	721	3,147	840	484	1,324	4.0	1.2	5.2	254
South Atlantic	1,615.60	1,358,868	459,854	1,818,722	5,919	5,097	11,016	841	285	1,126	3.7	3.2	6.9	165
East South Central	709.08	540,611	318,369	858,980	2,161	1,930	4,091	762	449	1,211	3.0	2.7	5.7	210
West South Central	1,457.93	782,325	280,656	1,062,981	4,202	3,494	7,696	537	193	730	2.9	2.4	5.3	138
Mountain	507.70	351,983	109,975	461,958	1,696	421	2,117	693	217	910	3.3	0.8	4.1	218
Pacific	1,099.34	1,821,001	400,477	2,221,478	4,051	1,960	6,011	1,656	364	2,020	3.7	1.8	5.5	370
Total	11,052.99	10,209,684	3,622,814	13,832,498	38,309	21,143	59,452	924	328	1,252	3.5	1.9	5.4	233
						- 1936 - (Estimates)								
New England	316.15	323,802	90,692	414,494	746	999	1,745	1,024	287	1,311	2.4	3.2	5.6	238
Middle Atlantic	5,033.10	5,342,296	1,510,973	6,853,269	13,660	7,704	21,364	1,061	300	1,361	2.7	1.5	4.2	321
East North Central	5,116.90	4,303,949	1,813,310	6,117,259	17,697	3,302	20,999	841	354	1,195	3.5	0.6	4.1	291
West North Central	1,262.07	1,009,262	513,301	1,522,563	3,703	731	4,434	800	407	1,207	2.9	0.6	3.5	343
South Atlantic	2,841.41	2,407,601	1,068,687	3,476,288	8,660	7,547	16,207	847	376	1,223	3.0	2.7	5.7	214
East South Central	1,516.65	989,009	849,422	1,838,431	4,521	3,270	7,791	652	560	1,212	3.0	2.2	5.2	236
West South Central	1,590.66	948,336	293,186	1,241,522	4,313	3,652	7,965	596	184	780	2.7	2.3	5.0	156
Mountain	759.10	540,057	181,560	721,617	2,583	719	3,302	702	236	938	3.4	0.9	4.3	219
Pacific	1,650.00	2,415,152	562,543	2,977,695	5,922	4,986	10,908	1,464	341	1,805	3.6	3.0	6.6	273
Total	20,086.04	18,279,464	6,883,674	25,163,138	61,805	32,910	94,715	910	343	1,253	3.1	1.6	4.7	266

Data on New Customers on Both Old and New Lines**

	Cost of Meters, Services & Transformers	Total Cost to Utilities	New Customers: Farm	New Customers: Non-Farm	New Customers: Total	Customer's Investment: Wiring Cost	Customer's Investment: Appliance Cost	Total Cost on Customer's Premises	Average Customer's Investment
				- 1935					
New England	80,805	287,734	769	1,667	2,436	195,428	167,661	363,090	149
Middle Atlantic	995,470	3,072,314	8,102	11,725	19,827	1,642,753	1,681,713	3,324,466	168
East North Central	1,522,073	4,085,550	14,863	3,890	18,753	1,967,818	2,251,617	4,219,435	225
West North Central	458,384	966,030	4,218	1,047	5,265	359,963	522,086	882,049	168
South Atlantic	735,504	2,094,372	9,229	9,625	18,854	883,934	1,424,275	2,308,209	122
East South Central	531,831	1,072,442	3,400	2,936	6,336	267,440	518,151	785,591	124
West South Central	532,487	1,314,812	8,650	6,454	15,104	273,213	921,050	1,194,263	79
Mountain	288,279	640,262	5,733	5,999	11,732	872,882	2,292,820	3,165,702	270
Pacific	1,537,175	3,358,176	8,192	9,347	17,539	916,384	6,829,451	7,745,835	442
Total	6,682,008	16,891,692	63,156	52,690	115,846	7,379,816	16,608,824	23,988,640	207
				- 1936 - (Estimates)					
New England	155,353	479,155	1,077	1,892	2,969	252,120	228,227	480,347	162
Middle Atlantic	2,009,989	7,352,285	16,019	13,247	29,266	2,960,118	3,264,684	6,224,802	213
East North Central	2,378,334	6,682,283	22,681	4,987	27,668	3,048,133	3,903,281	6,951,414	251
West North Central	743,062	1,752,324	5,086	1,101	6,187	506,827	611,887	1,118,714	181
South Atlantic	1,047,594	3,455,195	12,224	11,545	23,769	971,242	1,495,100	2,466,342	104
East South Central	1,091,824	2,080,833	5,929	4,338	10,267	428,955	752,570	1,181,525	115
West South Central	570,178	1,510,514	11,450	7,129	18,579	281,125	1,020,030	1,301,555	70
Mountain	340,875	880,932	6,790	6,171	12,961	960,208	2,455,813	3,416,021	264
Pacific	1,822,691	4,237,843	10,368	10,487	20,855	1,123,360	7,770,555	8,893,915	426
Total	10,159,900	28,439,364	91,624	60,897	152,521	10,532,088	21,502,147	32,034,635	210

* Compiled by Industry Committee on Rural Electrification from questionnaire sent out January 6, 1936 by E E I for that committee

** The data on number of new customers on existing rural lines are evidently somewhat in error, both for the 1935 figures and the 1936 figures. Some old customers must have been included for the average cost of meters, services and transformers on new lines, for 1935 figures out to be $61. per customer and this average cost for new customers on old lines figures out to be $54. per customer with considerable erratic differences among the several geographic divisions.

Rural Line Construction in 1936

THE number of miles of rural lines being built by the electric light and power companies this year are expected to almost double the number constructed in 1935, while the rate of construction is expected to reach that of 6 to 10 years ago. Nearly 100,000 rural customers are expected to take electricity from the new lines and close to 60,000 new rural customers to be added to existing lines, as compared with 60,000 rural customers on new lines and 56,000 rural customers added to existing lines last year. These figures are based upon a national survey recently completed by the Institute.

While the average cost for poles and wires per mile of line is estimated for 1936 to be slightly less than it was the year before, this is offset by an increase in the cost of transformers, meters and customer service connections, so that the total cost of rural lines remains about the same. The average cost for the power lines only is found to be $910 per mile and the total cost, including meters, transformers and services, about $1,250 per mile.

Because the construction of new rural lines, generally speaking, is in somewhat leaner territory, the customers per mile of line decreased from 5.4 to 4.7, and the utilities' investment to reach each customer rose from $233 in 1935 to $266 in 1936.

The results of the survey bring out once more the cardinal point about electric service, that the principal factor of cost is the charges on investment. This year's figures, for example, show that utility and customer combined invested on the average $476 to get electricity to one farmer whose average bill for current consumed, in areas not dominated by irrigation pumping, will be $4.00 per month.

An interesting phase of the survey is the tabulation of what the consumers themselves spent in order to avail themselves of electrical service. The following figures, which cover all new rural customers (that is, new customers added on existing lines, as well as those connected to new lines), show that $69 was spent by the customer himself in wiring his house and an additional $141 was spent in lamps and appliances:

Total number of new customers	152,520
Total cost of house wiring	$10,532,000 or $69. per customer
Total cost of appliances	21,502,000 or $141. " "
Total cost on consumers premises	$32,034,000 or $210. " "

NATIONAL SURVEY OF RURAL LINE CONSTRUCTION

	1936 (Estimated)	1935
Miles of new lines	20,086	11,053
Cost of new lines	$18,279,000	$10,210,000
Cost of meters, services and transformers	6,884,000	3,623,000
Total cost	$25,163,000	$13,833,000
Averages Cost per Mile:		
Lines only	$910	$924
Meters, services and transformers	343	328
Total cost per mile	$1,253	$1,252
Customers on New Lines:		
Farms	61,800	38,309
Non-farm customers	32,900	21,143
Total customers	94,700	59,452
Customers per Mile of Line:		
Farms	3.1	3.5
Non-farm customers	1.6	1.9
Total	4.7	5.4
Average Cost per Customer:		
In new lines	$193	$172
In meters, services and transformers	73	61
Total per customer	$266	$233
Each Customers Expenditures for Wiring and Appliances	$210	$207
New Customers Added on Existing Lines:		
Farm	29,820	24,847
Non-farm	27,980	31,547
Total Rural	57,800	56,394

A recapitulation of the national totals, comparing the expectation for 1936 with the actual results in 1935, as reported by identical utility companies, is shown in the lower table.

Handbook of Interior Wiring Design To Be Available in January

Printed copies of the Handbook of Interior Wiring Design, now under preparation by the Industry Committee, will be available this coming January, according to E. A. Brand, committee chairman.

The committee, meeting in New York City, September 11, reviewed and approved the complete text of the book as submitted by its technical subcommittee and is now taking steps to secure approval of sponsor organizations so that printing may get under way promptly.

Cooperating associations have already made definite commitments for the purchase of a total of 7000 copies of the Handbook.

The question of publicizing and promoting the Handbook as an all-industry document received the committee's serious consideration at the New York meeting, with the result that it was decided to form a publicity subcommittee drawn from all branches of the industry. The function of this subcommittee will be to prepare plans and a program covering both national and local promotion, with the idea of putting the Handbook in general use in the electrical industry as well as the architectural profession and building trades. The subcommittee personnel should be complete soon.

Looking toward the more distant future of the Handbook, members voted for continuance of the committee in order to preserve a permanent organization to maintain standards abreast of technical developments, receive the benefit of field experience and suggestions for change, make necessary revisions from time to time and sponsor continuing promotion of the Handbook. Accordingly, all members will approach their sponsor organizations officially, asking them to maintain continuous representation on the Handbook committee through two representatives, appointed for such terms as the sponsor body desires.

The committee will have an annual meeting every January, when officers—a chairman, vice-chairman and secretary—will be elected.

PRIZES

to be administered by the

EDISON ELECTRIC INSTITUTE

AND AWARDED IN 1937

PRIZES TO INDIVIDUALS

For Papers on Subjects Relating to the Electric Light and Power Industry

BYLLESBY PRIZE . . . . . *Accounting*

Cash prizes of $100, $50 and $25 donated by Public Utility Service Corporation, in memory of Colonel H. M. Byllesby, for the three most meritorious papers on any Accounting subject relating to the Electric Light and Power Industry.

FORBES PRIZE . . . . . *Public Relations*

A cash award of $250 donated by Mr. B. C. Forbes, Editor, Forbes Magazine, for the most meritorious paper dealing with the subject of Public Relations in the Electric Light and Power Industry.

LINDEMANN PRIZE . . . *Electric Cookery*

Cash prizes of $150, $100 and $50 donated by Mr. A. L. Lindemann, President, A. J. Lindemann and Hoverson Company, for the three most meritorious papers dealing with the Advantages of Electric Cookery for Domestic Purposes.

McGRAW PRIZE . . . . . *Engineering*

Cash prizes of $250, $150 and $100 donated by Mr. James H. McGraw, Honorary Chairman, McGraw-Hill Publishing Company, for the three most meritorious papers on any Engineering or Technical subject relating to the Electric Light and Power Industry.

RULES AND CONDITIONS OF CONTESTS FOR PRIZES TO INDIVIDUALS

Any person employed by an electric light and power company is eligible to enter the competition. No person is eligible to win two years in succession the identical prize or lower prize of the same award, but is eligible for a higher prize of that award. Papers must be the original work of the author or authors, prepared exclusively for this competition. Papers may be of any length, and should be illustrated. Papers should be typewritten on one side only.

Papers will not be returned to contestants, but will become the property of the Edison Electric Institute and will be available for inspection at the General Offices of the Institute. The right is reserved to publish any paper entered in the contest.

The first page of the manuscript must give the following information: the name of the prize for which the paper is submitted, title of paper, name of author, name and address of employing company, title or name of author's department. Only one paper may be submitted for more than one prize.

PAPERS FOR ABOVE PRIZES MUST BE FORWARDED, IN DUPLICATE, BY MARCH 1, 1937

two years in succession the identical prize or lower prize of the same award, but is eligible for a higher prize of that award. Papers must be the original work of the author or authors, prepared exclusively for this competition. Papers may be of any length, and must be illustrated. Papers should be typewritten on one side only.

served to publish any paper entered in the contest.

The first page of the manuscript must give the following information: the name of the prize for which the paper is submitted, title of paper, name of author, names and address of employer, author's title or position, and a statement as to whether the paper has been submitted for more than one prize.

PAPERS FOR ABOVE PRIZES MUST BE FORWARDED, IN DUPLICATE, BY MARCH 1, 1937

PRIZES TO COMPANIES AND INDIVIDUALS

For Accomplishments in Specified Activities

CHARLES A. COFFIN AWARD

Sponsored by the General Electric Company

A Gold Medal, known as the Charles A. Coffin Medal, will be awarded to the public utility operating company within the United States which, during the year 1936, has made a distinguished contribution to the development of electric light and power for the convenience and well being of the public and the benefit of the industry. The company awarded the medal will also receive $1,000 for its employes' benefit or similar fund.

AUGUSTUS D. CURTIS AWARD

Lighting of Buildings

A certificate donated by Messrs. Darwin Curtis and Kenneth Curtis, of Curtis Lighting, Incorporated, in memory of Augustus D. Curtis, to the public utility operating company within the United States which, during the twelve month period ending March 1, 1937, has shown the greatest contribution to the advancement of Artificial Illumination of interiors or exteriors of Commercial and Public Buildings, and a cash prize of $300 to the individual or individuals in that company responsible for the achievement. A second prize of $200 and a third prize of $100 to the individual or individuals responsible for the achievement of the companies adjudged second and third in the contest.

GEORGE A. HUGHES AWARD

Domestic Electric Cookery Load

A trophy donated by Mr. George A. Hughes, President, Edison General Electric Appliance Company, Inc., to the public utility operating company within the United States which, during the year 1936, has shown the greatest contribution to the development of the Domestic Electric Cookery Load through promotion, or selling, or both, and cash prizes totaling $1,000 to the individuals responsible for the achievement.

THOMAS W. MARTIN AWARD

Rural Electrification

A bronze plaque donated by Mr. Thomas W. Martin, President, Alabama Power Company, to the public utility operating company within the United States which, during the year 1936, has shown the greatest contribution to the advancement of Rural Electrification-Agricultural advancement within the company's territory due to uses of electricity, development of rural load, cooperation with other agencies, extension of rural lines, organization and plan for conducting rural electric development.

IMPORTANT—Complete details for the Charles A. Coffin Award, the Augustus D. Curtis Award, the George A. Hughes Award, and the Thomas W. Martin Award should be secured from the Secretary, Edison Electric Institute, 420 Lexington Avenue, New York, N. Y.

Elaborate and costly exhibits are unnecessary. The merit of the enterprise presented in papers or exhibits will be the prime factor in determining awards, without regard to the size of competing companies.

PRESENTATIONS OF ACCOMPLISHMENTS MUST BE FORWARDED BY APRIL 1, 1937

Papers and exhibits for 1937 prizes should be addressed to the Secretary, Edison Electric Institute, 420 Lexington Avenue, New York, N. Y. Winners will be announced and prizes awarded at the 1937 Convention of the Edison Electric Institute

PRIZE AWARDS COMMITTEE: Charles W. Kellogg, James E. Davidson, Frank W. Smith, *Chairman*, M. T. Chandler, *Secretary*

Trend of Lighting Voltages

By G. S. Merrill

Nela Park Engineering Department, General Electric Company

AN analysis of lighting voltages now in use in some 30,000 communities in this country (as listed in the Voltage Books which serve the lamp manufacturers as a guide for the distribution of their products) shows a slow continued trend toward 120.

TABLE I—PER CENT OF POPULATION LISTED SERVED AT DIFFERENT VOLTAGES

Voltage	1923	1928	1933	1936
110	36.3	15.9	5.2	2.0
115	40.9	61.6	61.7	58.9
120	19.4	22.4	33.0	39.0
All Others	3.4	0.1	0.1	0.1
	100.0	100.0	110.0	100.0
Average (1st three items only)	114.1	115.3	116.4	116.9

It is particularly interesting to note that 110-volt lighting has now diminished to a small figure, that 120-volt lighting is gaining at the expense of both 110 and 115 (115 reached its peak in 1933), and that all other lighting voltages reported represent a very small amount of service. Table II gives a detailed analysis by individual states. Corresponding figures for 1935 were published in the E.E.I. BULLETIN, September, 1935, page 374. One noteworthy change, which has recently been completed, has been in the Los Angeles area, where 120 has been generally adopted as a standard for lighting to replace both 110 and 115. It appears that within the next three or four years 120 might easily exceed the 50 per cent figure, and it is not beyond the bounds of possibility that it might eventually attain the position of a national standard utilization (socket) voltage for lighting.

In some communities two lighting voltages (115 and 120) are in use, and this dual standard invariably adds to the difficulty of insuring the supply of lamps of the correct voltage to the individual lighting customers in such areas. New names are continually being added to the list of dual-voltage communities, but, judging by past experience, a number of these will eventually bring their lighting voltage up to 120 as a single standard, thus contributing to the increase noted in the 120-volt percentage.

While the lower voltages are being gradually brought up to 120, it is important in the interest of eventually attaining a single country-wide standard lighting voltage to avoid, wherever possible, setting up new lighting circuits at 125 or 130 volts. The amount of such service today is very small, and fortunately it has shown no tendency to increase appreciably, so that it would appear that there might be no great difficulty in holding the top figure at 120.

TABLE II—ANALYSIS OF LIGHTING VOLTAGE BY STATES

Division and State	Population of Cities and Towns Listed in Voltage Book	Ave. Voltage Weighted According to Population Served	Percentage of Population Listed in Voltage Books Served at 110	115	120	125	130	All Others*
New England								
Maine	735,000	115.49	7.3	75.6	17.1	..	..	..
New Hampshire	486,700	116.65	1.4	64.2	34.4	..	..	..
Vermont	318,900	115.40	.7	90.9	8.1	.3	..	..
Massachusetts	4,453,400	115.19	5.4	85.3	9.3	..	..	..
Rhode Island	683,300	115.75	1.1	82.7	16.2	..	..	..
Connecticut	1,622,800	116.23	2.5	70.4	27.1	..	..	..
Middle Atlantic								
New York	12,025,800	118.80	.8	22.3	76.9	..	..	..
New Jersey	3,813,300	119.18	.2	16.1	83.7	..	..	..
Pennsylvania	7,739,900	115.28	.6	93.3	6.1	..	..	..
East North Central								
Ohio	5,272,500	115.88	.6	81.2	18.2	..	..	..
Indiana	1,843,400	116.30	4.6	66.7	28.0	.3	.3	.1H
Illinois	6,377,000	115.03	.6	98.1	1.3	..	..	..
Michigan	3,845,400	117.16	1.5	53.8	44.7	..	..	..
Wisconsin	2,052,800	117.41	1.8	48.4	49.8	..	..	..
West North Central								
Minnesota	1,644,000	116.26	2.1	71.3	26.6	..	..	..
Iowa	1,426,000	114.23	21.6	72.2	6.2	..	..	..
Missouri	2,257,500	115.07	.4	97.7	1.9	..	..	..
N. Dakota	269,000	115.55	1.0	87.1	11.9	..	..	..
S. Dakota	281,300	114.94	5.4	90.8	3.4	.4	..	..
Nebraska	718,800	116.87	3.9	56.4	39.6	.05	..	.05H
Kansas	1,022,100	115.47	2.5	86.4	11.0	..	.05	.05H
South Atlantic								
Delaware	166,000	118.85	.2	22.6	77.2	..	..	..
Maryland	1,204,400	118.74	.2	24.6	75.2	..	..	..
District of Columbia	486,869	115.00	..	100.0	..	..	..	..
Virginia	1,176,000	117.84	.6	42.0	57.4	..	..	..
W. Virginia	840,300	115.01	.3	99.3	.4	..	..	..
N. Carolina	1,088,300	117.21	4.3	47.1	48.6	..	..	..
S. Carolina	532,600	115.21	5.0	85.7	9.3	..	..	..
Georgia	1,147,900	115.94	3.5	74.2	22.3	..	..	..
Florida	953,300	115.40	4.9	82.1	13.0	..	..	..
East South Central								
Kentucky	1,037,400	116.98	7.1	43.8	48.3	..	..	.8L
Tennessee	1,132,900	115.42	3.4	84.8	11.8	..	..	..
Alabama	1,063,300	118.16	.6	35.6	63.8	..	..	..
Mississippi	555,900	115.97	.9	83.9	14.9	.05	..	.25H
West South Central								
Arkansas	551,400	115.68	3.6	83.0	9.7	3.7	..	..
Louisiana	992,900	118.17	3.2	30.8	65.7	.05	.25	..
Oklahoma	1,171,900	118.42	1.6	28.4	70.0	..	..	..
Texas	3,037,000	118.15	1.0	35.0	64.0	..	..	..
Mountain								
Montana	267,700	117.15	6.0	52.0	41.5	.2	.3	..
Idaho	221,000	119.97	2.8	5.9	91.3	..	..	..
Wyoming	1,037,700	116.23	2.2	71.0	26.8	..	..	..
Colorado	669,200	116.38	1.7	69.0	29.3	..	..	..
N. Mexico	260,800	116.07	2.4	90.0	6.8	..	..	.8H
Arizona	239,400	115.95	13.8	53.3	32.9	..	..	..
Utah	417,300	119.43	1.2	9.5	89.0	..	.3	..
Nevada	65,300	114.29	14.2	85.8	..	..	..	..
Pacific								
Washington	1,173,100	119.84	.3	4.3	95.3	..	..	.1H
Oregon	632,800	119.68	.4	5.6	94.0	..	..	..
California	4,835,300	118.65	.2	26.9	72.8	..	.1	..
U. S. Total and Averages	85,847,369	116.86	2.00	58.88	39.04	.04	.02	.02

H—above 130 L—below 110 Not included in Average.

Lindemann Prize Paper

Advantages of Electric Cookery For Domestic Purposes

By Mayme E. Miller

THE American housewife of today is noted for her acceptance of new ideas and new inventions. If this is not true, how else would one account for the invention, manufacture, sale and use of such conveniences as the electric lamp, vacuum cleaner, washing machine, iron, refrigerator, and now, that outstanding one of all—the modern Electric Range.

How many housewives of today would go back to the days of candles and oil lamps? To sweeping with the old-fashioned broom? Or, to stooping and rubbing clothes for hours on a wash board? To walking to and from a hot stove heating irons? How many would prefer an old-fashioned ice box, with all its uncertainty and inconveniences, to the modern, sparkling refrigerator of today. Housewives of today not only buy a device that looks modern, it must have modern advantages. If that is true, and it is, they are certain to become aware of the fact that with the Electric Range she gets all the advantages of these other conveniences, and more!

Picture the kitchen of a few years ago, with its old-fashioned stove. Real effort was required in order to keep it clean. Scrubbing and scouring! The air in this room was constantly being consumed and contaminated by the fuel. It was hot and uncomfortable. It had darkened walls and wilted curtains. The housewife who worked under these conditions very often had a wilted disposition and a "kitchen headache," her personal energy wasted. Women sacrificed time and beauty for the well-being of their families.

Contrast the kitchen of today made possible with new ideas and inventions; beautiful walls and floor coverings, sparkling glass and crisp curtains; cleanliness, comfort and pure air. The housewife wishes this to be permanent, therefore she selects only the best in modern tools. And isn't her task of preparing and cooking foods of paramount importance? It *is*—all other work which she may do is secondary to this: her job of feeding her family with food which is healthful to the highest degree. She knows that the only answer to this is Electric Cookery and all its advantages.

Miss Miller is the winner of the First A. L. Lindemann Prize for 1936. She has been employed by the Minnesota Power and Light Company at Little Falls, Minn., since September, 1929, as Home Economist. She has always taken an active part in all matters affecting the Company's interest, ranking among the first of the women employees of the Company.

Miss Miller also won the Third A. L. Lindemann Prize in 1935.

We know that the three great essentials of life are food, rest and shelter. Give a housewife a sparkling kitchen to work in, an electric range to work with, and the food will be perfect and the one who prepares it will have added time for rest and relaxation. Why? First of all, due to electric heat which is *flameless*, it can be controlled. It requires no oxygen, for this heat has no flame. There is no combustion; consequently there are no by-products of flame, no residue.

Electric Cookery is as *clean* and pure as the air we breathe. We have nothing in our kitchen which flame type fuels give us, which is dirt in every form, on the stove itself, on cooking utensils, walls and furnishings. With electricity we have an advantage which is priceless—cleanliness!

Simplicity is the watchword of electric cookery. There is nothing mysterious about it. Simply turn a switch and regulate the oven control if oven cooking is needed, or turn a surface switch to the heat intensity required for steaming, or any type of surface cookery. It is every woman's birthright to be a good cook. With the electric range she need have no fear of trying any recipe. As long as a good recipe, accurate measurements, and the proper type of cooking are applied, she will be one of the best cooks in the world. She will never have to apologize for meals not being served on time. With her modern Electric Range foods cook as fast as they can be cooked with any other type of fuel. Electricity has the advantage of performing instantly. Ovens can be heated to the desired temperature in less time than it takes to prepare the food.

Electric cookery to her means the *safest* kind of cooking. No matches, kindling or pilot light are necessary. There is no flame, naturally there are no fumes or gases. Fire hazards are eliminated, and inexperienced grown-ups, as well as children, are safe.

Here is an advantage not to be overlooked! More *healthful* foods are the result of being electrically cooked. Why? Because waterless cookery can be accomplished, due to controlled heat. In this manner all nutritive value and vital minerals are not thrown away. Children will have sturdy little bodies, and the older members of the family, health and cheerful dispositions. Natural moisture carries the flavor of the food and much of the food value. Foods are even more palatable, nutritious and healthful when cooked in the oven, because flameless heat requires no oxygen, therefore the oven can be of air-tight construction, causing no drying out of foods. Electrically broiled meats are not saturated with indigestible, unpalatable and unhealth-

ful scorched grease. Perfection in broiled foods is attained by the red, radiant heat, which it so beautifully gives us.

Every housewife knows that old-fashioned flame type fuels are the enemies of *comfort*. Kitchen headaches! Wrinkled brows! All are due to the excessive heat, contaminated air and uncertainty of that type of fuel. Scouring, scrubbing, cleaning and worrying—make her a veritable kitchen slave. All this work has now been eliminated, thanks to the Electric range. She now works in *comfort!*

She will not envy a good cook, but will be a good cook herself. With her Electric range she looks forward to trying a new recipe as a thrilling adventure. It is never an experiment. Her electric fuel is certain and accurate—it can be controlled to make the gentlest cooking possible, yet hot enough to cook any food in minimum time.

It is smart to be thrifty, and the American housewife of today realizes that. Electric ranges today are *economical,* due to waterless cookery which can be accomplished by controlled heat and insulated ovens with their automatic temperature controls. She will never have parched food. There will be no shrinkage, and since there is stored heat available in the burners and oven, this means she has the added advantage of stored heat.

Should a housewife be denied the privilege of earning? No, indeed—for her job is to "earn while she saves." The twin advantages of Electric cookery are economy and better results. By using little or no water and working with controlled heat she uses only enough fuel to accomplish her task. A small amount of water requires a small amount of fuel to heat—less cost! A small amount of water also does not need to be thrown down the sink. (If the kitchen sink were a living thing, it would be the healthiest thing alive, for so many minerals and food values go down its drain in liquid form.) The result is natural colors and flavors retained to a high degree, and none of the food is wasted.

More leisure for her family is another advantage she has with her Electric range. Her earning power does double duty. While working with controlled flameless heat, she cooks all foods according to temperature and time. No need for oven-peeking! More time for her family, hobby and social activities! If she is a business woman, with an automatic timer connected to the oven, she

(Continued on page 433)

SALES—ELECTRIC REFRIGERATORS

(Household Models Only)

MONTH OF AUGUST AND FIRST EIGHT MONTHS OF 1936-1935

	Month of August 1936	Month of August 1935	Month of July 1936	First Eight Months 1936	First Eight Months 1935
Total United States	106,975	110,161	205,098	1,753,632	1,369,861
Maine	285	467	151	6,907	7,430
New Hampshire	80	296	(46)	5,703	5,232
Vermont	216	204	449	4,360	3,286
Massachusetts	4,514	5,174	6,092	67,731	56,927
Rhode Island	745	693	403	8,753	7,273
Connecticut	1,851	2,909	4,632	30,263	22,134
Total New England	7,691	9,743	11,681	123,717	102,282
New York	18,431	21,426	22,667	192,661	157,477
New Jersey	4,623	4,436	6,937	73,136	59,024
Pennsylvania	8,768	7,702	19,241	159,975	108,825
Total Middle Atlantic	31,822	33,564	48,845	425,772	325,326
Ohio	6,242	6,032	14,582	115,143	84,385
Indiana	2,500	2,620	6,774	50,446	36,089
Illinois	5,226	8,370	17,746	131,566	103,158
Michigan	5,355	5,833	10,536	86,599	58,387
Wisconsin	1,497	2,752	2,722	30,180	24,057
Total East North Central	20,820	25,607	52,360	413,934	306,076
Minnesota	1,129	200	3,835	24,860	20,104
Iowa	711	1,844	3,856	27,698	24,213
Missouri	3,147	1,971	6,613	56,269	43,123
North Dakota	54	262	(124)	2,859	3,942
South Dakota	133	299	425	4,816	5,025
Nebraska	544	760	1,584	15,982	15,995
Kansas	563	969	2,045	21,003	18,744
Total West North Central	6,281	6,305	18,234	153,487	131,146
Delaware	271	66	555	3,532	3,008
Maryland	1,290	1,326	945	19,171	20,383
District of Columbia	744	623	3,463	16,635	10,890
Virginia	1,662	744	3,002	27,942	20,793
West Virginia	247	846	2,441	22,974	15,255
North Carolina	1,400	452	3,068	34,711	25,011
South Carolina	1,180	523	1,620	16,888	12,365
Georgia	864	1,888	3,025	30,120	26,895
Florida	2,799	2,377	3,689	21,286	20,484
Total South Atlantic	10,457	8,845	21,808	193,259	155,084
Kentucky	1,522	1,085	2,860	24,410	16,404
Tennessee	1,162	1,443	1,632	26,952	23,766
Alabama	858	879	2,264	20,065	21,514
Mississippi	1,047	567	1,029	10,299	7,108
Total East South Central	4,589	3,974	7,785	81,726	68,792
Arkansas	333	701	440	10,573	10,060
Louisiana	355	758	2,000	17,524	13,696
Oklahoma	542	580	1,412	18,037	16,761
Texas	4,642	3,795	8,164	72,709	59,923
Total West South Central	5,872	5,834	12,016	118,843	100,440
Montana	477	516	1,333	8,448	6,096
Idaho	96	421	1,227	8,681	6,891
Wyoming	48	141	660	2,782	2,355
Colorado	609	590	1,186	12,940	11,375
New Mexico	140	(57)	193	3,532	3,216
Arizona	123	181	162	5,644	5,508
Utah	300	345	1,062	10,648	7,209
Nevada	211	131	451	2,485	1,752
Total Mountain	2,004	2,268	6,274	55,160	44,402
Washington	2,140	1,770	3,564	29,645	20,368
Oregon	1,048	726	1,885	18,862	13,857
California	14,251	11,525	20,646	139,227	102,088
Total Pacific	17,439	14,021	26,095	187,734	136,313

This summary includes adjustment figures reported by several companies which do not represent their actual August sales but are corrections to be applied to their first seven months totals to give their correct total apportionment among the various states for eight months.
(Figures based on report issued by the National Electrical Manufacturers Association.)

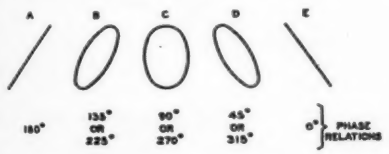
McGraw Prize Paper

A Method for Checking Current Transformer Connections To Multi-element Watthour Meters by Use of A Portable Cathode Ray Oscillograph

By Wallace C. Rudd

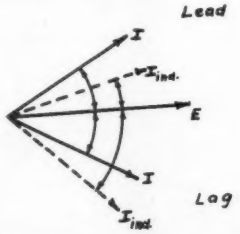
THE METHOD to be described consists of the use of a portable cathode ray oscillograph to give a visual indication of the phase difference between the voltage and current applied to any element of the watthour meter. From readings taken on the several elements and between elements the vector diagram of the metering circuit may be drawn.

The phase difference is shown on the screen of the oscillograph by the Lissajous figures obtained when a voltage and a current are applied to the deflecting plates of the cathode ray tube. These figures may be a slanted line, an ellipse or a circle. The slant and shape of the figure being a direct measure of the angular difference in phase of the voltage and current. Several figures and the angles indicated are shown below.



The oscillograph is primarily a voltage measuring instrument, therefore, in order to measure the phase difference between a voltage and a current, the current must be passed through a non-inductive resistance. The voltage drop across this resistance then being applied to the oscillograph deflecting plates. This voltage drop is in phase with the current.

The oscillograph by itself will not distinguish between an angle of lead and an angle of lag. This is accomplished by the use of an air core inductance which is inserted in series with the current under test. The voltage drop across this inductance being applied to the deflecting plates. Theoretically this introduces a lag in the current, which if the current is actually leading the voltage, will reduce the size of the angle shown on the screen, and which if the current is actually lagging the voltage, will increase the size of the angle shown on the screen. This action is shown in the vector diagram below.



Actually in practice the reverse is true. The insertion of the inductance causes a leading current to have a greater angle, and a lagging current to have a smaller angle. No adequate explanation has been found, as yet, for this reversal of theory.*

Mr. Rudd is the winner of the Third James H. McGraw Prize for 1936. He is twenty-six years old and is a graduate of Rensselaer Polytechnic Institute, Troy, New York. He received his grammar and high school education in Yonkers, New York.

He has been employed as a meter tester with the New York Edison Company, Inc., since 1933.

The measuring of the phase difference between a voltage and a current may be summarized in the following manner:

1. The voltage and the drop across the non-inductive resistance are applied to the oscillograph. An angle is read from the screen.
2. The drop across the resistance is replaced by the drop across the inductance and a new angle is obtained. If this second angle is less than the first, the current is lagging the voltage by the first angle. If the second angle is larger than the first the current is leading the voltage by the first angle.

From the above it may be seen that the angle between a voltage and a current may be measured over the entire 360 degrees. Phase difference readings are taken between each voltage and the currents in all the elements of the meter.

Thus in a three element meter readings would be taken between the upper element voltage and the upper, middle and lower element currents. The same would be done for the middle and lower element voltages. This will give nine readings. These three sets, (each voltage giving a set) are then combined to give the complete vector diagram. It may be seen from this diagram what errors are present in the connections of the meter. An ammeter is connected in series with the resistance. This gives the magnitude of the current vectors and will be an indication of the degree of unbalance in the circuit.

At times it is of some advantage to be able to measure the angle between two phase voltages. Such a case would be to check for a reversed potential coil only. Provision has been made in the apparatus to apply 2 voltages to the oscillograph. This is shown in the wiring diagram.

If any angle other than 120 degrees is obtained between voltages (on 3 element metering), it is a positive indication that there is an error in connections to the potential coils and of which coil.

*The voltage drop across the inductance is used. This drop leads the current by approximately 90 degrees and thus causes the observed phase shift.

The phase sequence cannot be determined from 2 voltages, only the angle between them. However the phase sequence can be found from the voltage current vector diagram.

The vector diagram is *not* a drafting room job. It is a rough sketch made at the time of the test. Thus any errors found may be immediately corrected and a recheck made with the oscillograph to determine if the connections are correct.

The actual time required to take these readings is about two minutes. A usual system load will hold reasonably steady for this length of time. The value of the load is unimportant. The author has checked connections with completely satisfactory results on loads as small as 80 milliamperes on a five ampere meter. The only limiting factor being the degree of amplification, of the drop across the resistance, or inductance, that may be obtained with the oscillograph amplifier.

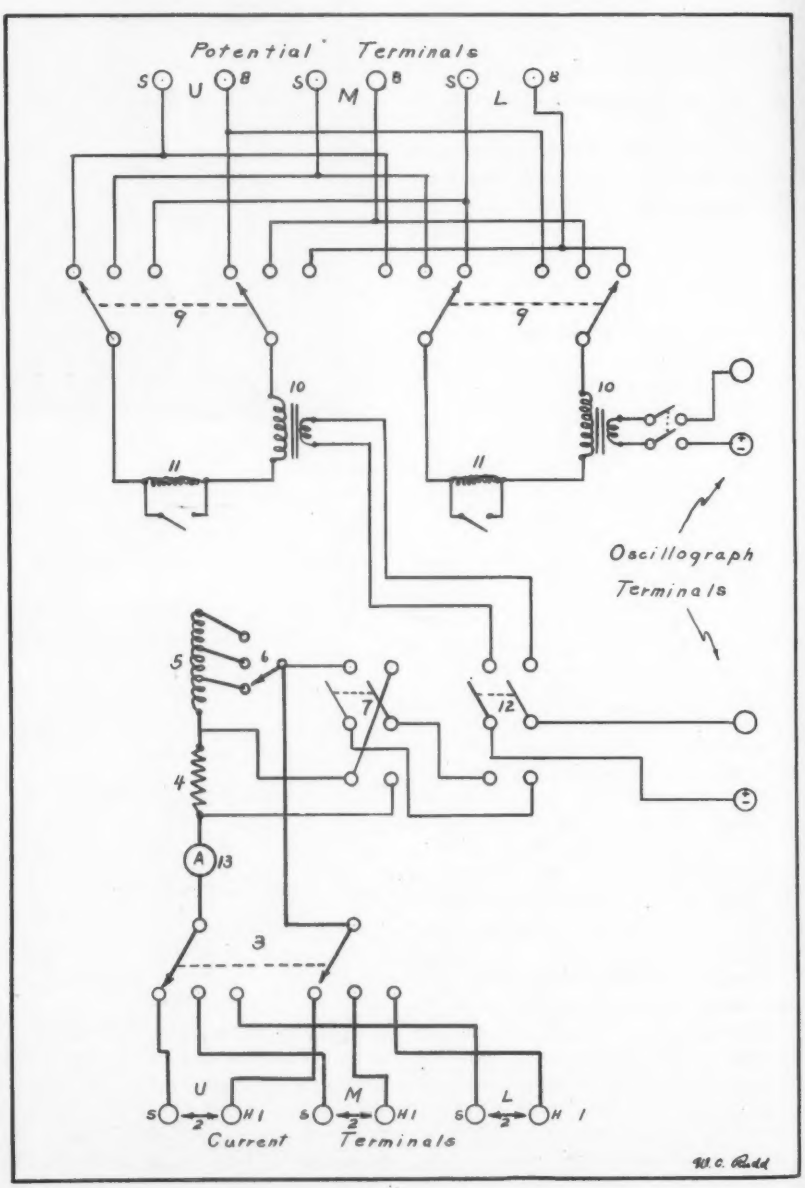
The apparatus required in addition to the portable oscillograph can be contained in a case 12 in. by 12 in. by 4 in. and weighs about ten pounds. The oscillograph weighs 39 pounds, which is no more than the average 150 ampere phantom load used for testing large capacity self-contained meters.

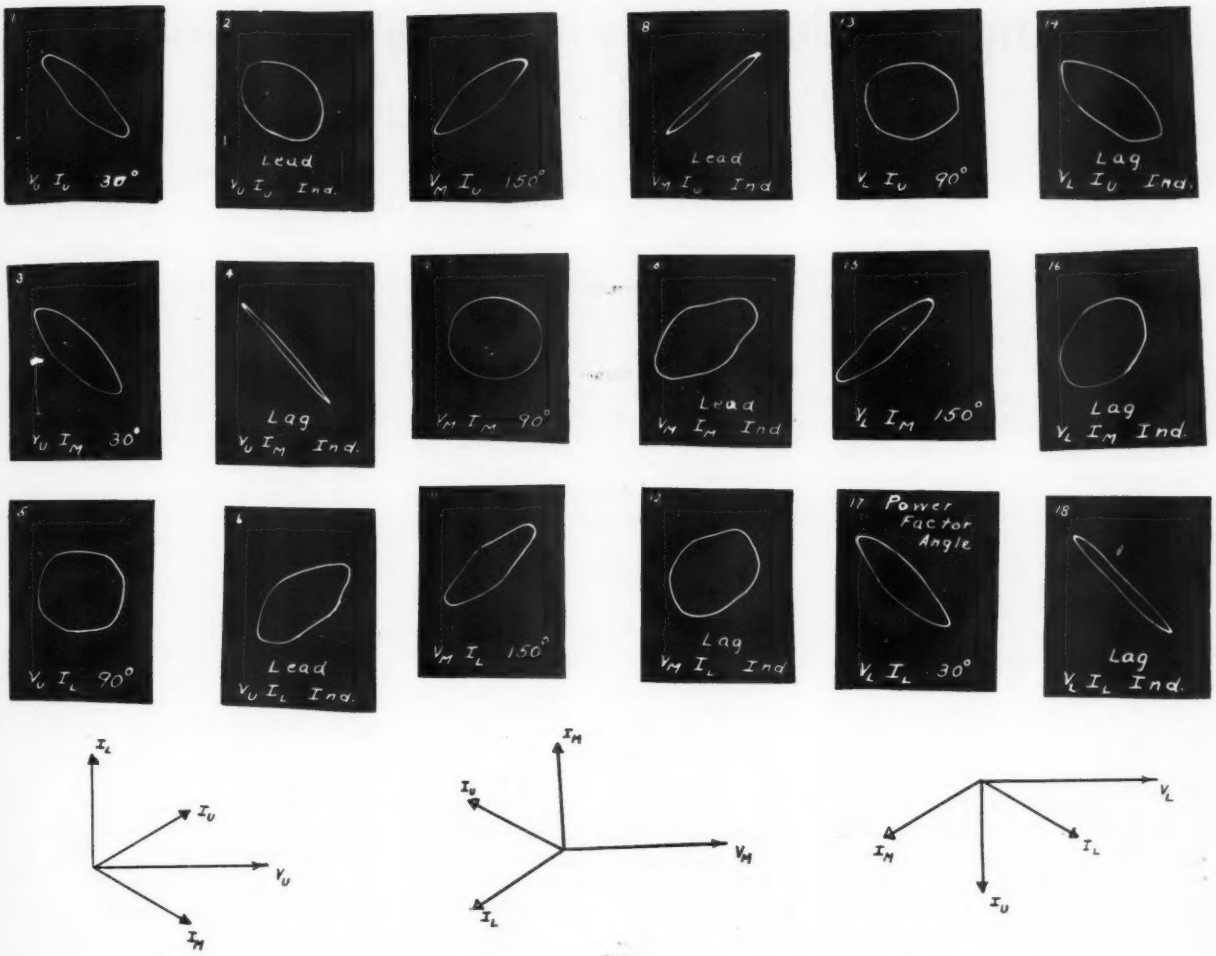
A wiring diagram of the additional apparatus is shown in the adjoining columns. This consists of the following apparatus and switches.

1. Terminals for the connection in series with the current coils of the meter.
2. Switches for short circuiting current transformers when not in use.
3. Selector switch to apply any current to the oscillograph.
4. Non-inductive variable rheostat (carbon pile) to be placed in series with current transformers. (2 to 10 volts drop required.)
5. Variable air core inductance, to be placed in series with current transformers. (2 to 10 volts drop required.)
6. Selector switch—used to select the value of inductance which will give approximately the right voltage drop to be applied to the oscillograph. The size of the figure is then adjusted by the amplifier in the oscillograph.
7. Double throw switch for applying the resistance drop or the inductance drop to the oscillograph.
8. Terminals for connection of the meter voltages.
9. Selector switches for applying any voltage to the oscillograph.
10. Transformers — used to insulate line voltage from the oscillograph. (The 180 degree reversal of phase in the transformer must be taken into account when making the connection.)
11. Impedance to be placed in series with transformer when 208 volts is used on potential coils of meter, as in two element metering.
12. Double throw switch to apply either a voltage or a current to the vertical plates—the horizontal deflector plates are used for voltage only.
13. Ammeter. (To aid in selection of value of inductance.)

The procedure on a test will be as follows:

1. Potential coils and current coils of the meter under test are connected to the terminals on the apparatus. If a two element meter is under test only the upper and lower terminals are used.
2. The upper element voltage is applied to the oscillograph and the amplifier adjusted to give a definite horizontal length of line on the screen.
3. The upper element current is then passed through the resistance and inductance. The drop across the inductance being applied to the oscillograph. A value of inductance is chosen which will give the same length line (vertical) as the voltage previously applied. This can be made exactly equal by adjusting the vertical amplifier on the oscillograph.
4. The switch is then thrown so that the resistance drop is applied to the oscillograph. The value of the resistance is then adjusted to give the same length of line on the screen as for the inductance. In this case the amplifier on the oscillograph must not be moved—all adjustments being made with the resistance in series with the current transformer.
5. The voltage and the resistance drop are then applied simultaneously to the oscillograph. A Lissajous figure will result. The angle is noted.
6. The inductance drop is then applied instead of the resistance drop and the change in angle is noted. Thus showing whether the current is lagging or leading.





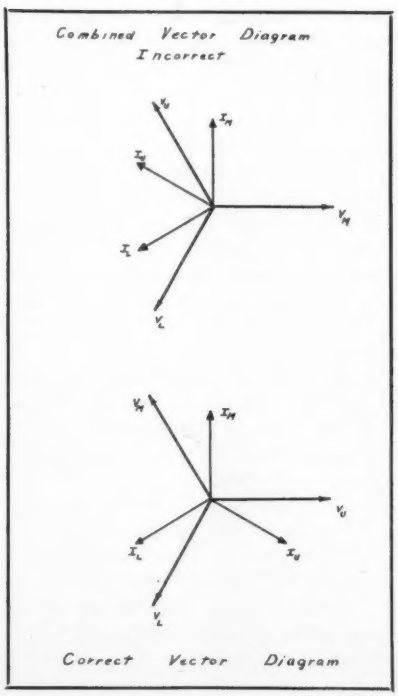
This is done for the several readings to be taken and the vector diagram is then sketched and any errors are noted and corrected.

Tests have shown that any error or combination of errors at any power factor on 3 element meters may be detected immediately. The author has found as many as four simultaneous errors in fifteen minutes.

In two element metering there are cases where both a current coil and a potential coil in one element are reversed. This gives correct metering but is not a so-called standard connection. This condition is difficult to find by this method of checking. It can be found by trial and error, however.

This method of checking connections should be especially valuable in checking multi-circuit meters for example, a 12 element meter.

In this type of meter the angle between the potential coil and any one of its 4 current coils can be no greater than that created by the power factor of the load. So, if a large angle is obtained on any one current coil in an element, it immediately stands out as being connected wrong.



Actual photographs for a typical error are shown. The upper element current was reversed and the upper and middle element voltages interchanged. The photographs also show the change in angle introduced by the inductance. From these photographs three vector diagrams (a voltage with three currents) are drawn. These are combined to give the final diagram. Analysis of this diagram indicates the errors, and the connections are corrected to give the other diagram shown which is the correct condition.

This test was made with an approximately balanced load at a lagging power factor. The power factor angle being shown in the photograph of I_L and V_L without inductance present.

A Simple Indexing System for an Inventory Of Station Equipment

By G. C. Baker
Brooklyn Edison Company, Inc.

THE indexing system to be discussed here has been applied to electrical equipment for generating and substations only but, as will be apparent, it lends itself equally well to mechanical and steam equipment.

The system is adapted to the accounting requirements of the Uniform System of Accounts for Electrical Corporations, as prescribed by the Public Service Commission. It uses the principle of the Dewey Decimal System of designation, can be applied to Hollerith or other mechanical recording systems, and can be made extremely simple or amplified to any extent desired. No attempt is made here to describe how to take an inventory or to define the limits of any inventory unit, but only to show how to apply the index to units already set up.

An example is assumed here in which it is desired to index the potential transformer on high-tension feeder number 2 in an A-C substation (the number will be 1-2-5). Following is a description of the system by which this will be done.

The first step in setting up the system is to arrange all the equipment in the station into functional divisions or classifications. For an alternating-current substation these classificatios, in part, would be:

High-tension feeder equipment
Main power transformers
High-tension busses
Low-tension feeder equipment
Station service equipment
Testing equipment
Etc.

These classifications are numbered in order, although not necessarily in this order, from 1 to n and the first part of our proposed index number is the number given to the particular classification.

Classification	Index
High-tension Feeder Equipment	1 -

The next step is to divide each classification into logical groups. The groups within any classification may be similar to each other or they may be dissimilar. In the Main Power Transformer classification, for instance, each transformer installation would be a group and the groups would probably all be similar. In the Testing Equipment classification there might be a group consisting of high-tension test facilities, and a dissimilar group consisting of low-tension test facilities, etc.

Within each classification the groups are similarly numbered from 1 to n. The group number becomes the second part of the proposed index. For the selected example the index will be:

Classification		
High-tension Feeder Equipment	Group No. 2	Index = 1-2-

Within each group may be one or more inventory units such as:

Circuit Breakers	Potential Transformers
Reactors	Conduit Runs
Cable Terminals	Cable Lengths
Current Transformers	Etc.

The number of units in a group need not necessarily be limited, although twenty to thirty units seem to be about the maximum desirable.

Each conduit run—or other similar item—might be a separate unit or a number of runs might be grouped together, depending on the requirements of the inventory. The writer believes that where the card system is not used, the best method is to list all conduits of the same size and material, for any one group, on the same sheet giving the length and the identity of each.

These units would be numbered in order beginning again with No. 1. It is not necessary that any particular sequence be followed although it will be somewhat easier to incorporate charges if units less likely to change are listed first and units more likely to change are listed last. It is also desirable that like units in similar groups have a similar sequence. This unit number becomes the third part of the proposed index. If potential transformers are numbered 5 in the series, then:

Classification	Group
H T Feeder Equipment	— No. 2
Unit	Index
Potential Transformer	= 1-2-5

Similarly the classifications, groups, and units are numbered for the entire station. Following is an incomplete list of inventory units with corresponding index numbers for a typical A-C substation.

361-1 High-tension Feeder Equipment
H T Feeder No. 1
1-1-1 High-tension Oil Circuit Breaker
1-1-2 Reactors
1-1-3 High-tension Cable Terminal
1-1-4 Current Transformers
1-1-5 Potential Transformer
1-1-6 5-Inch Iron Conduit
1-1-7 350 MCM 3/C Cable
1-1-8 No. 12 12/C Control Cable
H T Feeder No. 2
1-2-1 High-tension oil circuit breaker
1-2-2 Reactors
1-2-3 High-tension Cable Terminal
1-2-4 Current Transformers
1-2-5 Potential Transformer
1-2-6 5-inch iron conduit
1-2-7 350 MCM 3/c Cable
1-2-8 No. 12 12/c Control Cable
361-2 Main Power Transformers
Transformer No. 1
2-1-1 10,000 Kva Transformer
2-1-2 Low-tension oil circuit breaker
2-1-3 4-inch fiber conduit
2-1-4 2-inch iron conduit
2-1-5 2,000 MCM 1/c Cable
2-1-6 No. 12 7/c Control Cable
Transformer No. 2
2-2-1 10,000 Kva Transformer
2-2-2 Low-tension oil cirucit breaker
2-2-3 4-inch fiber conduit
2-2-4 2-inch iron conduit
2-2-5 2,000 MCM 1/c Cable
2-2-6 No. 12 7/c Control Cable
361-3 High-tension Busses
Bus Section No. 1
3-1-1 Bus Tie Circuit Breaker No. 1
3-1-2 Bus Section Reactors
3-1-3 4-inch fiber conduit
3-1-4 2,000 MCM 1/c Cable
3-1-5 No. 12 12/c Control Cable
Low Tension Feeder Group No. 1 (4 feeders)
361-4 Low-tension Feeder Equipment
4-1-1 Feeder oil circuit breaker (4)
4-1-2 Reactors
4-1-3 Regulators
4-1-4 4-inch iron conduit
4-1-5 2-inch iron conduit
4-1-6 350 MCM 3/c Cable
4-1-7 No. 12 12/c Control Cable
361-8 House Service Equipment
H S Transformer Bank No. 1
8-1-1 3-25 KVA Transformers
8-1-2 3 D & W fused cutouts
8-1-3 3-inch iron conduit
8-1-4 No. 2/0 1/c Cable
H S Motor Generator Set No. 1
8-4-1 4 Kw M. G. Set
8-4-2 Starting switch

(Continued on page 433)

New Data on Overhead Lines Under Storm Conditions

Storm Loading and Strength of Wood Pole Lines and A Study of Wind Gusts: An Experimental and Analytical Study of Storm Loading, and Strength During Storms, of Electric Power Distribution Lines, by R. H. Sherlock and others, 183 pages, 6" x 9", cloth bound, 116 figures, 10 charts, 16 tables. Published by Edison Electric Institute, 420 Lexington Ave., New York, N. Y. Price $2 per copy to members; $5 per copy to non-members.

AN IMPORTANT GAP in the knowledge of the properties of overhead line structures, under storm conditions, has been filled by the publication of the results of extensive research conducted over a period of several years to obtain exact data regarding the wind forces acting against the poles and conductors of power lines during storms and to determine the strength of wood poles under these conditions.

These data will make possible appreciable economies in line construction and be of considerable value in the furtherance of service stability in the rather extensive sections of the country subject to adverse weather conditions.

Until this research was completed no exact information was available as to the magnitude of the forces which acted upon aerial lines as a result of wind pressure against the wires and the supporting structures. Certain formulae, however, had been used to calculate the required strength of structures to withstand winds of various velocities, but these formulas were known to neglect factors of considerable importance which were difficult to evaluate. Consequently, there had always been serious doubt as to the accuracy of the accepted methods of designing overhead wire lines. To the engineers of the electrical supply companies who were responsible for the construction and operation of these lines this lack of definite engineering information was a serious one. Accurate knowledge was lacking as to the exact nature and magnitude of the wind loads that might be expected or of the ability of lines to withstand such loads.

The research described in the volume under review was initiated by the Overhead Systems Committee of the former N. E. L. A., with Mr. W. G. Kelley of the Commonwealth Edison Company as Chairman of the subcommittee responsible for the research program, and the actual research work was conducted by Professor R. H. Sherlock of the University of Michigan, with the cooperation of Messrs. M. B. Stout, W. G. Dow, J. S. Gault and R. S. Swinton, also of the University of Michigan. Mr. Harold Cole of the Detroit Edison Company served as the field representative of the Committee and maintained close contact with the work throughout the period of investigation. The Edison Electric Institute assumed sponsorship of the research after the dissolution of the N. E. L. A. in 1933.

Among the results accomplished by the research and reported in this volume are:

1. A much better understanding of pole line behaviour under storm conditions than was previously possible has resulted, since for the first time actual measurements have been made on full size models.

2. A method of analyzing pole behaviour by means of probability curves has been developed which permits the correlation of all the elements involved in the loading and strength of pole lines and makes it possible to predict the probable frequencies of occurrence of any assumed critical load.

3. A means of interpreting the results of wind tunnel tests has been established in terms which are applicable to conditions experienced on the power line in the field.

4. It is shown that the forces acting upon the pole line are not simply those due to wind pressure but a combination of wind and the inertia forces produced by the oscillation of poles and wires as in a mechanical system. The relation between wind velocity and the resultant force tending to break the poles is therefore a complex one which can only be expressed by means of the laws of probability.

5. It is shown that while there are often wide and rapid fluctuations in wind velocity, commonly called gusts, these variations are least pronounced during the more intense parts of storms.

6. It is shown that the strength of a line is greater than that of the weakest pole and the means of determining the extent to which the interaction between poles will transfer load from the weaker to the adjacent stronger poles is given.

7. It is shown that poles under storm conditions are subjected to fluctuating loads and that under these conditions the poles show greater breaking strength than when subjected to steady loads.

8. It is shown that with wide spacing in accordance with usual practice, shielding of one wire by another is not a major factor.

9. It is shown that topography has an appreciable effect on the wind forces acting on a line.

In conducting the research work an experimental line one-quarter of a mile long was built in which the conductors were given a special covering to simulate the weight and wind resistance of a one-half-inch radial thickness of ice. Instruments were developed to measure the forces bending the poles, the tension and transverse forces in the conductors and the velocity of the wind at three points along the line. All instruments were so designed that they did not modify the natural movement of the poles and conductors, and were arranged so that their records could be match-marked and correlated.

A new type of pressure plate and anemometer was developed which was very responsive to rapid changes to wind velocity so that it could be used for studies of wind gust. Five of these were mounted on a steel tower 250 feet in height and seven of them at 60-foot horizontal intervals on the top of wooden poles. This made it possible to obtain both a horizontal and a vertical cross-section of the passing wind gusts. New type wind-direction recorders were also developed and installed.

Poles were tested to failure under a type of dynamic loading which simulated storm conditions. Tests determined the changes which occurred in the elastic properties of poles under long continued dynamic loading.

Observations were made during the storms of four winters beginning in the fall of 1928. Two very intense storms occurred during the first winter, but the storms of the three following winters yielded less important data on pole line loading.

It was found that the poles and conductors became an oscillating mechanical system under storm conditions. Hence it was necessary to show the relation between wind velocity and pole loading in the form of frequency distribution diagrams such as are used in statistical work.

There was an interaction between the poles in the line which caused the stiffer poles to assume a larger share of the wind force than the more flexible ones. When the ground is soft the distribution of wind load to the individual poles depends not only on their relative flexural stiffness, but also upon the relative resistance to movement in the ground. In practice, the strength of the line is greater than the strength of the weakest pole, since the interaction transfers load from the weaker to the adjacent stronger poles.

Since the topography of the ground may affect the forces acting against a pole line by modifying the wind velocity, the experimental line was located on a ridge having an abrupt slope to the

windward at one end, and a rather flat but uneven slope at the other. If the upward components of the wind direction had any effects they were so small that they were obscured by the changing conditions of interaction between poles.

The resistance of the specially covered conductors in the wind tunnel were substantially the same as for ice-covered specimens. The coefficient of resistance was lower for specimens with icicles than for smooth, cylindrical ice-covered specimens.

The average ultimate stress of eleven poles tested to destruction under fluctuating loads was slightly greater than that of the two hundred and fifty-six poles tested elsewhere by others under static loads. The dispersion of results was not as wide in the former case as in the latter.

When a pole was tested under fluctuating loads there was an initial set which occurred within the first few cycles of oscillation of the pole, remained constant during six hours of continuous oscillation, and disappeared within a few minutes after oscillation was stopped. The modulus of elasticity was the same under fluctuating loads as under static loads, but varied with the weather and with the seasons.

All storm winds had a westerly component. The average velocity of the wind increased with height, but within the height of 250 feet, the gradient of maximum gust velocities was irregular and it is probably different for different localities. This is due to the influence of topography which may even cause a decrease of velocity with height for some distance upward, and to the influence of large size eddies which seem to form at some most favorable height.

The conductors of the leeward side of the group whipped about more violently than those on the windward side. The windward conductors took a larger share of the wind load while the velocity was increasing rapidly. After the gust front had passed there was little, if any, difference between their relative wind loads. A method is outlined by which the result of this investigation may be correlated with the long-time records of wind velocity at the United States Weather Bureau Stations.

The arrangement of the report is such that the objectives, methods, and results of the investigation may be easily obtained. The table of contents is sufficiently complete so that one may determine in advance those portions in which he will be most interested.

New E.E.I. Publications

POWER STATION CHEMISTRY—1936

E.E.I. Pub. D-5. A report of the Prime Movers Committee, Edison Electric Institute, 8 pages. Price 20c to members and their employees; 50c to non-members in the U.S.A.; 55c to foreign countries.

This report reviews the activities of the Power Station Chemistry Subcommittee since its reorganization.

It represents a detailed method for flue gas analysis.

It includes a comprehensive discussion on the use of sodium sulphite for removing dissolved oxygen in boiler feed-water.

BOILERS, ECONOMIZERS, AIR HEATERS AND PIPING—1936

E.E.I. Pub. D-6. A report of the Prime Movers Committee, Edison Electric Institute, 34 pages. Price 60c to members and their employees; $1.50 to non-members in the U.S.A.; $1.60 to foreign countries.

This report contains statements by the Subcommittee, Operating Companies and Manufacturers covering operating and design problems related to boilers, superheaters, economizers, air heaters and their auxiliaries together with a brief statement on foreign boiler developments.

COMBUSTION—1936

E.E.I. Pub. D-7. A report of the Prime Movers Committee, Edison Electric Institute, 36 pages. Price 60c to members and their employees; $1.50 to non-members in U.S.A.; $1.60 to foreign countries.

This report contains statements by Operating Companies and Manufacturers on:

Combustion of Oil and Gas Fuels.
Pulverizers and Pulverized Fuel.
Stokers.
Combustion Control.
Mechanical Draft Equipment.
Ash and Dust Elimination and Ash Disposal Equipment Furnaces (other than pressure parts of water-cooled furnaces).

PRINCIPLES AND PRACTICES IN GROUNDING

E.E.I. Pub. D-9. A Joint Report of the Accident Prevention, the Electrical Equipment, and the Transmission and Distribution Committees, Edison Electric Institute. Price 40c to members and their employees; $1.00 to non-members in U.S.A.; $1.10 to foreign countries.

These Principles and Practices in Grounding have been developed to meet a need expressed by many for an authoritative statement on grounding and related matters in electric light and power systems. The large influence of widely differing local conditions, together with the continually changing state of the art, have combined to make it impossible to offer inflexible rules or regulations. Further, complication is sometimes added to individual cases by conflicting rules of government and other regulatory bodies. But with all these handicaps it is believed that the Principles and Practices will be found helpful and a sound guide.

SUPERPOSITION OF HIGH PRESSURE NON-CONDENSING EQUIPMENT ON EXISTING POWER STATIONS

E.E.I. Pub. D-8. A report of the Prime Movers Committee, Edison Electric Institute, 12 pages. Price 25c to members and their employees; 65c to non-members in U.S.A.; 75c to foreign countries.

This report discusses:

Superposition Outlook.
Reasons for Adoption of Superposition.
Its Development.
Its Scope and Available Alternatives.
Its Advantages.
Restrictions on Its Use.
Extracts from Operating Company Statements.

OIL AND GAS ENGINES—1935-36

E.E.I. Pub. D-10. A report of the Prime Movers Committee, Edison Electric Institute, 15 pages. Price 40c to members and their employees; $1.00 to non-members in the U. S. A.; $1.10 to foreign countries.

This report discusses:

Diesel-engine progress and trends, diesel production, new developments, new installations in U. S. A. and foreign countries.

Operating and maintenance problems, high-speed systems, exhaust heat recovery equipment.

Diesel plant auxiliary equipment; cooling water systems, exhaust-heat recovery equipment.

Diesel fuel oil; ignition quality, A.S.T.M. specifications.

Internal combustion engine insurance; types offered, rate classification, comparison with steam plant insurance cost.

Recent legislation, fuel taxes, operators' licenses, fire and safety regulations.

Engine prices, cost data for medium and high speed diesels.

Plant operating data, covering 75 engine units, maintenance costs, operating factors and outages.

Manufacturers' statements.

Empire State Association Annual Convention

ONE HUNDRED and forty executives, junior executives and department heads of the various gas and electric companies of New York State met for the thirty-first annual convention of the Empire State Gas and Electric Association at Saranac Inn, Oct. 1st and 2nd.

E. R. Acker, who a few days before at a meeting of the Executive Committee, had been elected president, presided at the opening session with J. P. Haftenkamp, vice-president, presiding at the second session.

A splendid array of talks and papers covering problems of management were presented by prominent speakers within and without the industry.

President Acker reviewed the activities of the association over the past year with some pertinent suggestions as to a future course. Announcement was made of the death of three of its prominent members: Eugene Rosenquest, Walter C. Phelps and John L. Wilkie. Announcement was also made of the resignation, due to ill health, of the association's secretary, C. H. B. Chapin.

L. B. Denning, president of the American Gas Association spoke on the National and State Association relationships and outlined a plan of employee selling as being undertaken by his company at Dallas, Texas, with considerable success.

Alfred H. Schoellkopf, president of the Niagara Hudson Power Corporation, spoke on Rural Electrification. "Forty per cent of the working farms in New York State, or about 66,000, are now connected to rural lines," he said. This was an increase of 164 per cent in the number served in the last decade.

He fixed the number of miles of lines operating in the state at 23,000 and announced 4,500 additional miles to serve 18,000 new customers had been authorized for construction or in the planning stage.

In actual number of electrified farms, New York State, he said, is outranked only by California.

J. P. Haftenkamp, vice-president of the Rochester Gas and Electric Corporation addressed the meeting on combination gas and electric service from the standpoint of the customer's interest.

C. W. Kellogg, president of the Edison Electric Institute, brought out that the most effective answer to charges of excessive electric rates is the steady reduction in household rates going on month by month accompanied by a growing use of current. "This is the most effective propaganda," he said. "It is the solidest foundation on which any business can rest."

E. R. ACKER

President of the Empire State Gas and Electric Association

H. C. Davidson, secretary of the Consolidated Edison Company, presented a paper on the place of management in accounting regulation. He reviewed the years work of accounting groups in their labors over prescribed accounting system promulgated by the Federal Power Commission and the Association of Utility Commissioners. Much justifiable criticism was leveled at such accounts and definitions as Original Cost, Depreciation Accounting, Continuing Property Record and Segregation of Investment in Distribution and Transmission Systems.

Marion B. Folsom, treasurer of the Eastman Kodak Company spoke on social security. He reviewed the Federal and New York State Acts and pointed out the inconsistency of some of their provisions. Social security, he stated in one form or another is here to stay and business men might well formulate their plans accordingly.

One means of preserving private ownership and operation of utilities is to have a strong, aggressive state regulatory commission, in the opinion of Colonel Charles G. Blakeslee, former counsel of the New York State Public Service Commission, who spoke next on the program.

H. C. Thuerk, assistant to the vice-president, Utility Management Corporation, gave a talk illustrated with talking pictures, of the organization of a group of Minute Men in his company, who were employees especially trained in handling many diverse problems in regard to public relations. Properly trained by education and instruction these groups have been of enormous value in assisting to a better understanding between company and customer. The force of outside propaganda directed against the industry is largely broken by the intelligent use of employees who have been schooled in the true aims and purposes of the business.

Rocky Mountain Association Convention

TWENTY-TWO states were represented in the attendance at the convention of the Rocky Mountain Electrical Association, held at Santa Fe, N. M., Sept. 21-23. The gathering was one of the largest in the history of the industry in that area.

Guy W. Faller, vice president and general manager of the Public Service Company of Colorado, Denver, will be the skipper of the good ship R. M. E. A. during 1937. Mr. Faller will be a skipper in fact as well as in name, for he saw several years' service in Uncle Sam's navy. He will succeed K. W. Kissick of Trinidad, whose term as president expires December 31.

Gaylord B. Buck, general commercial manager of the Public Service Company of Colorado, received the Association's annual Award of Merit, a diamond-set gold medal, in recognition of his leadership and outstanding achievements on behalf of the Association and industry of the Rocky Mountain region generally.

Though the Association was the recipient of the American Trade Association Executives' "Certificate of Recognition" several months ago, it was not until the convention that it was officially presented. Association Manager George E. Lewis, whose brief, describing the activities of his organization, was a material factor in winning the award, shared honors with his association when the certificate was for-

mally presented by Governor Clyde Tingley of New Mexico.

The theme of the convention was lighting. To emphasize this thought, every delegate wore the replica of an I. E. S. lamp tag, with his name imprinted thereon. The reverse of the badge was a sight-saving pledge.

The patio of La Fonda hotel, convention headquarters, was brilliantly illuminated, principally by what is said to be the largest I. E. S. lamps in the world. These two lamps were twelve feet in height. Each had a 1,000-watt lamp. The largest I. E. S. tag in the world—four by seven feet—was suspended from the ceiling in the meeting room. Every lady present was given a late model floor lamp as a convention favor.

As an old-world contrast with modern lighting, and as part of the decorative scheme, the Association lined every balcony and parapet of the hotel with hundreds of "luminarios"—paper sacks half filled with sand, in each of which was a candle, the light of which shone through the paper.

George M. Gadsby, president, Utah Power & Light Company, stressed the value of widespread use of I. E. S. lamp as load-builders. "Once Again Aladdin Rubs His Lamp," was the subject of his address. J. L. Stair of Curtis Lighting, Inc., and other authorities on illumination were on the program.

Accounting, management, and engineering problems also received much attention during the convention. The recently revived engineering and accounting divisions of the Association rendered comprehensive reports, reviewing the past year's energetic activities of those two groups.

Clarence A. Davis of Moldredge, Neb., general counsel for various power companies in that state which are opposing government encroachment in the power field, gave an eloquent exposition of the situation as it now exists in Nebraska. His talk was supplemented by charts and other visual evidences supporting his discourse.

C. E. Greenwood, commercial director, Edison Electric Institute, New York, spoke on "The Expanded Horizon in Utility Load-Building." He declared that, through concerted effort by such organizations as the Rocky Mountain Electrical Association, the industry, during the balance of this year and in 1937, will experience one of the greatest business periods in its history.

Mr. Buck, who spoke on "The First Two Million Are the Hardest," indicated during his remarks that the first 2,000,000 I. E. S. lamps, which number will be in use by the end of the present year in the United States, will be missionaries that will bring about the use of additional millions of such light units on an even more rapid basis than was the growth of electric refrigeration.

GUY W. FALLER
President-elect, Rocky Mountain Electrical Association

K. M. Robinson, president, Idaho Power Company, Boise, greatly speeded up interest in electric water heaters as load-builders when he told of the success with which his company is meeting in marketing these appliances. He also emphasized the value of the electric range as a load-builder and the possibilities of rapid business marketing of this piece of merchandise.

Other key speakers on the three-day program were C. W. Leihy, engineering editor, *Electrical West*, San Francisco, and W. J. Kyle, Byllesby Engineering and Management Corporation, Chicago.

Officers of the Association who will serve with President-Elect Guy W. Faller are: A. H. Heitzler, Public Service Company of Colorado, Denver; O. B. Summers, New Mexico Power Company, Santa Fe; J. H. Jacobucci, Utah Power and Light Company, Green River, Wyoming, vice presidents; W. C. Sterne, Arvada Electric Company, Denver, treasurer; E. E. Brazier, General Electric Supply Corporation, Denver; William Trudgian, Westinghouse Electric and Manufacturing Company, Denver. Manager Lewis will continue as Secretary of the Association.

New York State Foots Largest Share of TVA Cost

NEW YORK ranks first among the states in the amount of money contributed to the Tennessee Valley Authority, according to figures compiled by the Committee of Utility Executives. On the basis of its percentage of total internal revenue collections in the fiscal year 1935, the Empire State would pay 20.38 per cent, or 100 million dollars, of the bill of $491,000,000 for projects completed or planned by the TVA.

Being outside of the Tennessee Valley area, New York receives no benefit from helping to pay the light bill of residents in that section. This is true of all of the ten states making the largest payments to the TVA. The list of the ten ranking states is given below:

State	Percentage of Total Internal Revenue Collections	Proportionate Amounts Payable to TVA
New York	20.38	$100,065,800
Illinois	9.79	48,068,900
North Carolina ...	8.60	42,226,000
Pennsylvania	7.40	36,334,000
California	5.36	26,317,600
Ohio	4.97	24,402,700
Virginia	4.28	21,014,800
Michigan	4.12	20,229,200
New Jersey	3.47	17,037,700
Massachusetts	3.46	16,988,600

In contrast to these figures, Tennessee, the state which receives most of the benefits of the TVA, would pay, on this basis, only .65 per cent of the cost, or approximately $3,191,500.

The survey points out that the above figures represent only the contributions made by these states to the capital cost of constructing the Government power dams and plants. In addition, the ten states will also be the principal contributors to make up the operating deficits of the TVA in selling electric power at less than cost. Making allowance for interest and depreciation—not included in the TVA's report—these deficits last year amounted to over one and one-half cents for every kilowatt hour sold by the TVA to residents in the Valley. As the power program is more fully developed, these deficits will, of course, become larger, and the burden upon the the states outside of the area will be correspondingly increased.

"Utility companies operating in the area are unable to compete against this subsidized competition," the survey concludes. "As their business is taken away, the more than one million investors in their securities will witness the gradual destruction of their investment."

Prime Movers Committee Meeting

P. W. Thompson, Chairman

THE Prime Movers Committee met in Cleveland at the Hotel Cleveland, Sept. 28th-29th. Because of the greatly increasing use of high pressure and high temperature steam in modern plants, much of the meeting time was spent in consideration of the status of piping and bolting material specifications. Several new tentative specifications are now available from A.S.T.M.

Preliminary plans for the various subcommittee reports were discussed. The chairmen of last year's subcommittees have been reappointed, as follows:

Turbine Subcommittee	D. S. Brown
Boiler Subcommittee	W. E. Caldwell
Combustion Subcommittee...	James Muir
Diesel Engine Subcommittee.	Louis Elliott
Power Station Data Subcommittee	E. H. Krieg
Chemistry Subcommittee....	C. F. Fellows

Excepting for the Diesel Engine Subcommittee, all of the subcommittees will concentrate upon information on and results with high pressure and temperature equipment.

The Tuesday morning Round Table discussion was taken up principally with miscellaneous problems in connection with existing high pressure plants and proposed plants.

Inspection trips were made to the boiler tube manufacturing plants of Steel and Tubes, Incorporated, and to the Ashtabula Station of the Cleveland Electric Illuminating Company.

The next meeting of the committee will be held in conjunction with the annual meeting of the A.S.M.E. in New York City, to permit attendance at the A.S.M.E. meeting and the Power Show.

Advantages of Electric Cooking

(Continued from page 424)

has a meal cooking for her while she is away from home, and is ready to serve it when she returns.

She no longer dreads the canning season. Her electric oven is a miniature canning factory, and fruits, berries or vegetables canned electrically are healthful and beautiful as well. This is accomplished with air-tight insulated ovens and automatic temperature control. Electric oven canning is now a recognized success. Besides, the kitchen remains cool and clean during the entire period, and the housewife is happy and comfortable while doing this work.

She will be proud to own and operate her Electric range. It will be as beautiful ten years from now as it is today, for there are no destructive gases and rust to disintegrate it. Electricity for cooking does nothing to wear the range, and requires only a few minutes each week to keep it sparklingly clean. It seldom requires service.

The American housewife knows that homemaking is a lofty career. With her Electric range she can make the most of her career, because it will enable her to become a more charming hostess. Her kitchen will be the center of hospitality —she will be noted for her informal entertaining.

She will be proud of her Electric range because it is flameless and safe. She is safe in the knowledge that she is safeguarding her family's health, and that her home is more beautiful and livable. She will find that the poet's myth "a woman's work is never done" has been expended, and that with Electric Cookery she has *all* the advantages for Domestic Purposes.

Indexing System

(*Continued from page* 428)

8-4-3 2-inch iron conduit
8-4-4 No. 6 1/c Cable

Not all of the units of any station are listed here, but sufficient are shown to illustrate the application. There is no limit to which the system cannot be amplified to meet any need, but as illustrated is suitable for a very simple inventory.

The system without change can be used when it is desired to associate costs with inventory units. It is only necessary to place the index number on the cost sheet and arrange the sheets in the sequence of the index numbers.

If costs are associated with inventory units it is very simple, with this system, to determine the cost of any low tension feeder, or of all of the low tension feeders, or of any other subdivision of the equipment.

The N.U.E.A. Official Debate Handbook

"ELECTRIC UTILITIES", the official Debate Handbook of the National University Extension Association, covering the subject "Resolved, That all electric utilities should be governmentally owned," together with a supplementary volume, is published by Lucas Brothers, Columbia, Mo. The two volumes are priced at 75 cents each. The debate subject was chosen by the Association for the 1936-1937 debates by high school and college students in most of the states, after debating leagues throughout the nation had expressed their choice. This year's debate is the tenth in a series that have been sponsored by the Association, and it is expected that more than 100,000 students will participate in the debates.

The two volumes are edited by Professor Bower Aly of the University of Missouri. The first contains an Analysis and Interpretation of the Electric Light and Power Question by Professor Aly; a chapter on Angles and Facets of the Question by Professor Roy Emerson Curtis, also of the University of Missouri; an annotated bibliography of books and articles containing material relating to the debate question; and a number of special articles contributed by authors speaking definitely for one side or the other of the question. Thus a contribution by Carl D. Thompson, Secretary of the Public Ownership League of America is followed by one from Frank A. Newton, Chairman of the Rate Research Committee of the Edison Electric Institute; an article on the Tennessee Valley Authority by Dr. A. E. Morgan, is met with one on the same subject by Mr. Willkie of Commonwealth Southern.

Other contributors to the first volume include: Harry W. Laidler, Executive Director, The League for Industrial Democracy; Warren M. Persons, Consulting Economist; Joy Elmer Morgan, Editor, the Journal of the National Education Association; David Friday, Director, National Bureau of Economic Research; Morris L. Cooke, Administrator, Rural Electrification Administration; H. C. Baldwin, College Service Dept., Babson's Reports, Inc.; Judson King, Director, National Popular Government League and William M. Carpenter, Economist, Edison Electric Institute.

The second and supplementary volume consists of an extensive number of reprints from books, magazines, and official reports grouped into the following sections: General Considerations, Involved in the Electric Utilities. The History of the Electric Utilities. The Present Status of the Electric Utilities. Recent Governmental Activities in the Electric Utilities. Electric Utilities in Foreign Countries. Arguments for Government Ownership of Electric Utilities. Arguments against Government Ownership of the Electric Utilities.

PUBLICATIONS OF THE INSTITUTE

Pub. No.		*Date Issued*	*Price to Members*	*Price to Non-Members*	*Price to Foreign Countries*
D1	The Objective Type Rates; 1933-1936	(4/36)	$0.80	$2.00	$2.15
D2	The Electric Light and Power Industry in 1935	(6/36)	.30	.75	.85
D5	Power Station Chemistry—1936	(7/36)	.20	.50	.55
D6	Boilers, Economizers, Air Heaters and Piping—1936	(9/36)	.60	1.50	1.60
D7	Combustion, 1936	(10/36)	.60	1.50	1.60
D8	Superposition of High Pressure Non-Condensing Equipment on Existing Power Stations	(10/36)	.25	.65	.75
D9	Principles and Practices in Grounding	(10/36)	.40	1.00	1.10
C4	Boilers, Economizers, Air Heaters and Piping—1935	(7/35)	.60	1.50	1.60
C5	Turbines, Condensers and Feedwater Heaters—1935	(7/35)	.40	1.00	1.10
C6	Combustion—1935	(8/35)	.80	2.00	2.50
C7	Air Conditioning—1935	(9/35)	.50	1.25	1.35
C8	Oil and Gas Engines—1934-1935	(10/35)	.50	1.25	1.35
C9	Methods of Measuring Radio Noise	(11/35)	.15	.35	.45
C10	Symbols for Metering Diagrams	(12/35)	.10	.10	.10
C11	Cable Operation—1934	(12/35)	.60	1.50	1.60
C12	Twelve Messages on Accident Prevention in the Electric Public Utilities	(12/35)	.10	.10	.10
C14	Resuscitation Charts	(4/36)	1-10 copies 11-100 copies 101-1000 copies 1001 or more	.10 each .05 each .04 each .03 each	
B1	Electric Service for Oil and Gasoline Pipe Line Pumping	(3/34)	.10	.25	.30
B2	Air Conditioning—1934	(5/34)	.75	1.85	2.00
B3	Condensers, Feedwater Heaters, Evaporators, and Boiler Feed Pumps—1934	(6/34)	.45	1.15	1.25
B4	Turbines—1934	(6/34)	.40	1.00	1.10
B5	Station Piping—1934	(7/34)	.60	1.50	1.60
B7	Oil and Gas Engines	(8/34)	.40	1.00	1.10
B8	Steam Generation	(8/34)	.60	1.50	1.60
B9	The Electric Light and Power Industry in 1933	(10/34)	.30	.75	.85
B10	Electrical Energy Diversion	(10/34)	.20	.50	.55
B11	Cable Operation—1933	(12/34)	.60	1.50	1.60
B12	A-C Network Operation—1932-1933	(12/34)	.40	1.00	1.10
A2	Station Piping	(8/33)	.60	1.50	1.60
A3	Turbines	(8/33)	.75	1.85	2.00
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POWER SALES ITEMS

DIESEL ENGINES

"Diesel Mechanical Developments," by Max Potter. *Power Plant Engineering,* September, 1936, p. 522. Technical Publishing Company, Monodnock Block, 53 West Jackson Blvd., Chicago, Ill., Publishers.

Large units of over 2000 b. hp. show trend toward standardized practice. Fuel economy 13.5 to 14 net kwhr per gallon.

"Diesel Power Service." Manufacturers Record, September, 1936. Manufacturers Record Publishing Company, P. O. Box 548, Baltimore, Md., Publishers.

This article outlines the increased use of Diesel engines and types of industries where installations have been made. It is of special interest to power engineers as the article gives operating costs for several installations.

ELECTRIC APPLICATIONS

"'Entoleter' by Corona Kills Cereal Insects," by L. B. Haddad. *Electrical World,* August 15, 1936, p. 86. McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City, Publishers.

Small article describing method of killing insects in the grain stream and in the packaging machine.

ELECTRIC FURNACES

"Heat Treating Alloy Bar Stock in Electric Furnaces," by Dr. Marcus A. Grossman. *Iron and Steel Engineer,* September, 1936, p. 17. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Abstract of paper to be presented before A. I. & S. E. Convention at Detroit.

"Annealing and Normalizing Auto Body Steel in Electric Furnaces," by F. T. Hague and P. H. Brace. *Iron and Steel Engineer,* September, 1936, p. 47. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Paper to be presented before A. I. & S. E. Convention, Detroit.

"New Uses of Electric Furnace Brazing Process," by H. M. Webber. *General Electric Review, August,* 1936, p. 381. General Electric Company, 1 River Road, Schenectady, N. Y., Publishers.

This article concerns the superseding of previous methods.

FURNITURE INDUSTRY

"Demand Increasing for Furniture," by Dr. A. P. Haake. *Manufacturers Record,* August, 1936. Manufacturers Record Publishing Co., P. O. Box 548, Baltimore, Md., Publishers.

An article covering the furniture industry which will be of interest on account of its plea for expansion of production by modernization and replacement of obsolete equipment in furniture factories.

LIGHTING

"Steel Mill Lighting," by Walter Sturrock. *Iron and Steel Engineer,* August, 1936, p. 1. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Paper and discussion of recent developments and improvements in lighting, particularly the visibility meter and the mercury vapor lamp.

LIQUEFIED GAS

"Liquefied Petroleum Gas Industry." *Manufacturers Record,* August, 1936, Manufacturers Record Publishing Co., P. O. Box 548, Baltimore, Md., Publishers.

This article will be of interest to power engineers, as it describes the growth of an industry which will provide competition to electric heat in industry and elsewhere. The fuel may be used in internal combustion engines for power purposes.

OIL REFINERIES

"Oil Refineries Using More Electric Power," by Richard Henry. *Electrical World,* August 15, 1936, p. 39. McGraw-Hill Publishing Co., Inc., 330 West 42nd Street, New York City.

Recent developments in equipment for safety and economy influence the decision to use electric power, but purchased power is meeting stiff competition.

POWER GENERATION

"The Use of Process Steam for Power Generation," by H. H. Foreman. *Gas Age-Record,* August 8, 1936, pp. 149-153. Robbins Publishing Co., Inc., 9 East 38th Street, New York City, Publishers.

This is a study of four gas-fueled manufacturing plants, which shows savings made by using process steam to generate electricity. The article shows that electric power is obtainable by this process at a cost of less than one-half mill per kwhr.

"The Superposition Power Plant," by N. D. Gove. *Power Plant Engineering,* September, 1936, p. 512. Technical Publishing Company, Monadnock Block, 53 West Jackson Blvd., Chicago, Ill., Publishers.

The superposition power plant offers an attractive way of utilizing existing equipment without sacrificing the high thermal efficiencies of the modern high pressure plant.

REFRIGERATING PLANTS

"Selecting the Type of Drive for the Refrigeration Plant," by V. L. Maleev, Professor of Mechanical Engineering, Oklahoma A. & M. College. *Southern Power Journal,* September, 1936, pp. 44-47. W. R. C. Smith Publishing Company, Grant Building, Atlanta, Ga., Publishers.

A review of selecting the most economical prime mover for a refrigeration plant, with a comparative table of over-all power costs based on electric and oil engine drives.

STEEL MILLS

"Steel Mill Developments," by W. H. Burr, Lukens Steel Co., Coatesville, Pa. *Iron and Steel Engineer,* September, 1936, p. 36. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Report of the A. I. & S. E. Committee at Detroit Convention.

"Development of the Great Lakes Steel Corporation," by Julius A. Clauss, Chief Engineer. *Iron and Steel Engineer,* September, 1936, p. G L 3. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Description of a few of the major items of equipment and process, with a flow sheet of the mill.

"Steel Plant of the Ford Motor Company." *Iron and Steel Engineer,* September, 1936, p. 3. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Description of equipment, how it functions, and a flow sheet of the mill are presented.

STRIP MILLS

"Individual Motor Drives on Strip Mills," by F. E. Harrell and W. R. Hough. *Iron and Steel Engineer,* September, 1936, p. 28. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Paper to be presented before the A. I. & S. E. Convention, Detroit.

"Material Handling in Hot Strip Mills," by F. M. Gillies. *Iron and Steel Engineer,* September, 1936, p. 29. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Paper to be presented before the A. I. & S. E. Convention, Detroit.

"Electrical Strip Mill Equipment," by L. A. Umansky. *Iron and Steel Engineer,* September, 1936, p. 34. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Paper to be presented before the A. I. & S. E. Convention, Detroit.

TOP PLANTS

"Top Saves $104,000 Yearly," by S. Blum and E. R. Feicht. *Power,* August, 1936, p. 410. McGraw-Hill Publishing Co., Inc., 330 West 42nd Street, New York City, Publishers.

High-pressure equipment superimposed on existing plant of Container Corporation of America at Manayunk in Philadelphia meets power requirements without increasing steam demand. Paper mill.

WELDING

"Resistance Welding in Steel," by Walter Anderson and Malcomb Clark. *Iron and Steel Engineer,* September, 1936, p. 27. Association of Iron and Steel Engineers, 1018 Empire Building, Pittsburgh, Pa., Publishers.

Paper to be presented before the A. I. & S. E. Convention, Detroit

Computation of Zero-Sequence Impedances of Power Lines and Cables

THE report of Project Committee 2J* entitled "Computation of Zero Sequence Impedances of Power Lines and Cables" has been approved as Engineering Report No. 37 by the Joint Committee on Plant Coordination. This report is a revision of Provisional Report No. 3, issued under date of May 14, 1931. In the report, formulas are developed for computing zero-sequence impedance and ground-wire or sheath currents of power lines and cables. Formulas are expressed in terms of the self and mutual impedances of conductors treated as ground-return circuits. Charts showing the self and mutual impedance of conductors with ground return, and tables of conductor resistances are provided to facilitate computations. Comparisons between computed and experimental values of zero-sequence impedance and ground-wire currents are made for several different lines. A method of computing zero-sequence capacitance of power lines is also included.

The principal differences between this and the original report consist in the addition of a new section dealing with the zero-sequence capacitance of power lines and the addition of two Appendices relating, respectively, to the zero-sequence impedance of lines with finite leakance between ground wires and ground and to the zero-sequence impedance of cables containing magnetic material. A simplification of the method of determining the zero-sequence impedance and distribution of fault current in the case of a fault within a twin-circuit section of a power line has also been made.

This report is included in Volume IV of Engineering Reports of the Joint Subcommittee on Development and Research which is now being printed. It is expected that this volume will be available in about two months. Copies of Engineering Report No. 37 in mimeograph form are available at a price of 80c to members and $2.00 to non-members.

* Of the Joint Subcommittee on Development and Research, EEI and Bell System.

CONVENTIONS AND MEETINGS

OCTOBER

1- 2	Empire State Gas & Electric Association, Saranac Inn, N. Y.
1- 2	Indiana Electrical Association, French Lick, Ind.
4- 9	National Electrical Manufacturers Association, Netherland Plaza Hotel, Cincinnati, Ohio.
5- 9	National Safety Council Congress, Atlantic City, N. J.
9	Sales Committee, E.E.I. Headquarters, New York, N. Y.
7-10	Electrochemical Society, Niagara Falls, Ont.
8- 9	Transmission and Distribution Committee, E.E.I., Peabody Hotel, Memphis, Tenn.
12-14	National Electrical Contractors Association, Biltmore Hotel, Atlanta, Ga.
14-16	American Society of Civil Engineers, New York, N. Y.
15-16	Accident Prevention Committee, E.E.I., Lord Baltimore Hotel, Baltimore, Md.
26-27	Electrical Equipment Committee, E.E.I., Sagamore Hotel, Rochester, N. Y.
26-28	American Institute of Electrical Engineers, Dallas, Texas.
26-30	American Gas Association, Atlantic City, N. J.

NOVEMBER

10-13	National Association of Railroad and Utilities Commissioners, Atlantic City, N. J.
11-13	American Institute of Chemical Engineers, Baltimore, Md.
30	American Society of Mechanical Engineers, New York, N. Y.

DECEMBER

1- 4	American Society of Mechanical Engineers, New York, N. Y.
25-29	American Institute of Electrical Engineers, New York, N. Y.

National Power and Resources Policies

(Continued from page 412)

before it was promulgated, the public welfare requires increased efficiency both as to reliable service and reduction of costs. The means named to achieve this aim are interconnection of utility services and elimination of such competition as would have harmful effects on national economy. Consequently, endeavors will be made to provide Germany with a comprehensive network of electric service which will make it possible to cover the requirements of all important consumption areas at the lowest possible rates and with absolute safety of operation, and the rights of interdiction and "impost" laid down in the Act will prove a valuable help in this direction. In the presence of such requirements for the sake of the community, the private interests of utilities must rank second.

The obligation laid down in these regulations to accept a poor bargain as well as a good one, places public utilities under a very exacting regime regarding their standard of efficiency. It is, therefore, only fair that they should be entitled to such legal protection as is required to maintain that standard. In this connection the wording of the Act that "rates should be adapted to economic necessity," where it deals with the rights of intervention of the Reich Minister of Economy, conveys a particular meaning. Intervention bearing on rate policy must never go beyond a limit where the economic operation of utilities would be endangered or where the transactions would cease to be a sound business proposition. The Act considers that the principle of reliable service, including the capacity to meet every requirement as completely as possible, should even overrule the principle of supplying at cheap rates. It further considers that customers can enjoy permanent satisfactory service only when utilities are in a position to increase their efficiency and reduce production costs.

Another point of importance is taxation, and in this connection we should mention, as an interesting item of recent development, that the privilege of exemption from the corporation profits tax enjoyed by publicly owned utilities was withdrawn in 1934 in order to provide an equal basis for private and publicly owned utilities.

More important than legal provisions, however, is a spirit of honest cooperation between Government and national economy.